✓ **عنوان پژوهش:**

Discrimination of Bacteria Using Surface-Enhanced Raman Spectroscopy

✓ **نویسندگان:**

Jarvis R.M., Goodacre R.

✓ **خلاصه پژوهش:**

Raman spectroscopy has recently been shown to be a potentially powerful whole-organism fingerprinting technique and is attracting interest within microbial systematics for the rapid identification of bacteria and fungi. However, while the Raman effect is so weak that only ~1 in 108 incident photons are Raman scattered (so that collection times are in the order of minutes), it can be greatly enhanced (by some 103-10 6-fold) if the molecules are attached to, or microscopically close to, a suitably roughened surface, a technique known as surface-enhanced Raman scattering (SERS). In this study, SERS, employing an aggregated silver colloid substrate, was used to analyze a collection of clinical bacterial isolates associated with urinary tract infections. While each spectrum took 10 s to collect, to acquire reproducible data, 50 spectra were collected making the spectral acquisition times per bacterium ~8 min. The multivariate statistical techniques of discriminant function analysis (DFA) and hierarchical cluster analysis (HCA) were applied in order to group these organisms based on their spectral finger-prints. The resultant ordination plots and dendrograms showed correct groupings for these organisms, including discrimination to strain level for a sample group of Escherichia coli, which was validated by projection of test spectra into DFA and HCA space. We believe this to be the first report showing bacterial discrimination using SERS.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/ac034689c

✓ **نام ژورنال:**

Analytical Chemistry

✓ **سال انتشار:**

2004

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Characterization of the Surface Enhanced Raman Scattering (SERS) of bacteria

✓ **نویسندگان:**

Premasiri W.R., Moir D.T., Klempner M.S., Krieger N., Jones II G., Ziegler L.D.

✓ **خلاصه پژوهش:**

The surface enhanced Raman scattering (SERS) of a number of species and strains of bacteria obtained on novel gold nanoparticle (~80 nm) covered SiO 2 substrates excited at 785 nm is reported. Raman cross-section enhancements of > 10 4 per bacterium are found for both Gram-positive and Gram-negative bacteria on these SERS active substrates. The SERS spectra of bacteria are spectrally less congested and exhibit greater species differentiation than their corresponding non-SERS (bulk) Raman spectra at this excitation wavelength. Fluorescence observed in the bulk Raman emission of Bacillus species is not apparent in the corresponding SERS spectra. Despite the field enhancement effects arising from the nanostructured metal surface, this fluorescence component appears "quenched" due to an energy transfer process which does not diminish the Raman emission. The surface enhancement effect allows the observation of Raman spectra of single bacterial cells excited at low incident powers and short data acquisition times. SERS spectra of B. anthracis Sterne illustrate this single cell level capability. Comparison with previous SERS studies reveals how the SERS vibrational signatures are strongly dependent on the morphology and nature of the SERS active substrates. The potential of SERS for detection and identification of bacterial pathogens with species and strain specificity on these gold particle covered glassy substrates is demonstrated by these results.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/jp040442n

✓ **نام ژورنال:**

Journal of Physical Chemistry B

✓ **سال انتشار:**

2005

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

A Eukaryotic-like Ser/Thr Kinase Signals Bacteria to Exit Dormancy in Response to Peptidoglycan Fragments

✓ **نویسندگان:**

Shah I.M., Laaberki M.-H., Popham D.L., Dworkin J.

✓ **خلاصه پژوهش:**

Bacteria can respond to adverse environmental conditions by drastically reducing or even ceasing metabolic activity. They must then determine that conditions have improved before exiting dormancy, and one indication of such a change is the growth of other bacteria in the local environment. Growing bacteria release muropeptide fragments of the cell wall into the extracellular milieu, and we report here that these muropeptides are potent germinants of dormant Bacillus subtilis spores. The ability of a muropeptide to act as a germinant is determined by the identity of a single amino acid. A well-conserved, eukaryotic-like Ser/Thr membrane kinase containing an extracellular domain capable of binding peptidoglycan is necessary for this response, and a small molecule that stimulates related eukaryotic kinases is sufficient to induce germination. Another small molecule, staurosporine, that inhibits related eukaryotic kinases blocks muropeptide-dependent germination. Thus, in contrast to traditional antimicrobials that inhibit metabolically active cells, staurosporine acts by blocking germination of dormant spores. © 2008 Elsevier Inc. All rights reserved.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1016/j.cell.2008.08.039

✓ **نام ژورنال:**

Cell

✓ **سال انتشار:**

2008

✓ **کلیدواژه‌ها:**

DEVBIO; MICROBIO; SIGNALING

✓ عنوان پژوهش:

Phosphoproteome analysis of E. coli reveals evolutionary conservation of bacterial Ser/Thr/Tyr phosphorylation

✓ نویسندگان:

Macek B., Gnad F., Soufi B., Kumar C., Olsen J.V., Mijakovic I., Mann M.

✓ خلاصه پژوهش:

Protein phosphorylation on serine, threonine, and tyrosine (Ser/Thr/Tyr) is generally considered the major regulatory posttranslational modification in eukaryotic cells. Increasing evidence at the genome and proteome level shows that this modification is also present and functional in prokaryotes. We have recently reported the first indepth phosphorylation site-resolved dataset from the model Gram-positive bacterium, Bacillus subtilis, showing that Ser/Thr/Tyr phosphorylation is also present on many essential bacterial proteins. To test whether this modification is common in Eubacteria, here we use a recently developed proteomics approach based on phosphopeptide enrichment and high accuracy MS to analyze the phosphoproteome of the model Gram-negative bacterium Escherichia coll. We report 81 phosphorylation sites on 79 E. coli proteins, with distribution of Ser/Thr/Tyr phosphorylation sites 68%/23%/9%. Despite their phylogenetic distance, phosphoproteomes of E. coli and B. subtilis show striking similarity in size, classes of phosphorylated proteins, and distribution of Ser/Thr/ Tyr phosphorylation sites. By combining the two datasets, we created the largest phosphorylation site-resolved database of bacterial phosphoproteins to date (available at www.phosida.com) and used it to study evolutionary conservation of bacterial phosphoproteins and phosphorylation sites across the phylogenetic tree. We demonstrate that bacterial phosphoproteins and phosphorylated residues are significantly more conserved than their nonphosphorylated counterparts, with a number of potential phosphorylation sites conserved from Archaea to humans. Our results establish Ser/Thr/Tyr phosphorylation as a common posttranslational modification in Eubacteria, present since the onset of cellular life. © 2008 by The American Society for Biochemistry and Molecular Biology, Inc.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1074/mcp.M700311-MCP200

✓ نام ژورنال:

Molecular and Cellular Proteomics

✓ سال انتشار:

2008

✓ کلیدواژه‌ها:

✓ **عنوان پژوهش:**

Characterisation and identification of bacteria using SERS

✓ **نویسندگان:**

Jarvis R.M., Goodacre R.

✓ **خلاصه پژوهش:**

Within microbiology Raman spectroscopy is considered as a very important whole-organism fingerprinting technique, which is used to characterise, discriminate and identify microorganisms and assess how they respond to abiotic or biotic stress. Enhancing the sensitivity of Raman spectroscopy is very beneficial for the rapid analysis of bacteria (and indeed biological systems in general), where the ultimate goal is to achieve this without the need for lengthy cell culture. Bypassing this step would provide significant benefits in many areas such as medical, environmental and industrial microbiology, microbial systems biology, biological warfare countermeasures and bioprocess monitoring. In this tutorial review we will report on the advances made in bacterial studies, a relatively new and exciting application area for SERS. © 2008 The Royal Society of Chemistry.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1039/b705973f

✓ **نام ژورنال:**

Chemical Society Reviews

✓ **سال انتشار:**

2008

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

SERS detection of bacteria in water by in situ coating with Ag nanoparticles

✓ نویسندگان:

Zhou H., Yang D., Ivleva N.P., Mircescu N.E., Niessner R., Haisch C.

✓ خلاصه پژوهش:

The bio-sensing for the convenient detection of bacteria has been widely explored with the use of various sensing materials and techniques. It is still a challenge to achieve an ultrasensitive and selective, but simple, rapid, and inexpensive detection method for bacteria. We report on surface-enhanced Raman scattering (SERS) for the detection of living bacteria in drinking water by employing a synthesis of silver nanoparticles coating the cell wall of bacteria. We found that the Raman signals intensity of bacteria after AgNP synthesis mainly depends on the zeta potential of the cell wall. The enhancement of the Raman signal of bacteria using this strategy is about 30-fold higher than that in the case of a simply mixed colloid-bacterial suspension. The total assay time required is only 10 min and the total reactants' volume needed to analyze bacteria in a real environment is as low as 1 mL. Particularly, only one droplet of 3 μL sample is necessary for each SERS measurement. Furthermore, we can use this novel strategy to discriminate three strains of Escherichia coli and one strain of Staphylococcus epidermidis by hierarchy cluster analysis. Finally, we can detect bacteria down to 2.5 × 102 cells/mL on a hydrophobic glass slide by SERS mapping. Thus, our detection method offers prominent advantages, such as reduced assay time, simple handling, low reactant volumes, small amount of sample, and higher sensitivity and selectivity compared to previously reported label free methods. This novel strategy may be extended to open an avenue for developing various SERS-based biosensors. © 2014 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/ac402935p

✓ نام ژورنال:

Analytical Chemistry

✓ سال انتشار:

2014

✓ کلیدواژه‌ها:

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Surface-enhanced Raman spectroscopy for bacterial discrimination utilizing a scanning electron microscope with a Raman spectroscopy interface

✓ نویسندگان:

Jarvis R.M., Brooker A., Goodacre R.

✓ خلاصه پژوهش:

Surface-enhanced Raman scattering (SERS) utilizing colloidal silver has already been shown to provide a rapid means of generating "whole-organism fingerprints" for use in bacterial identification and discrimination. However, one of the main drawbacks of the technique for the analysis of microbiological samples with optical Raman microspectroscopy has been the inability to acquire preemptively a region of the sample matrix where both the SERS substrate and biomass are both present. In this study, we introduce a Raman interface for scanning electron microscopy (SEM) and demonstrate the application of this technology to the reproducible and targeted collection of bacterial SERS spectra. In secondary electron mode, the SEM images clearly reveal regions of the sample matrix where the sodium borohydride-reduced silver colloidal particles are present, Stokes spectra collected from these regions are rich in vibrational bands, whereas spectra taken from other areas of the sample elicit a strong fluorescence response. Replicate SERS spectra were collected from two bacterial strains and show excellent reproducibility both by visual inspection and as demonstrated by principal components analysis on the whole SERS spectra.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/ac049663f

✓ نام ژورنال:

Analytical Chemistry

✓ سال انتشار:

2004

✓ کلیدواژه‌ها:

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Label and label-free based surface-enhanced Raman scattering for pathogen bacteria detection: A review

✓ **نویسندگان:**

Liu Y., Zhou H., Hu Z., Yu G., Yang D., Zhao J.

✓ **خلاصه پژوهش:**

Rapid, accurate detection of pathogen bacteria is a highly topical research area for the sake of food safety and public health. Surface-enhanced Raman scattering (SERS) is being considered as a powerful and attractive technique for pathogen bacteria detection, due to its sensitivity, high speed, comparatively low cost, multiplexing ability and portability. This contribution aims to give a comprehensive overview of SERS as a technique for rapid detection of pathogen bacteria based on label and label-free strategies. A brief tutorial on SERS is given first of all. Then we summarize the recent trends and developments of label and label-free based SERS applied to detection of pathogen bacteria, including the relatively complete interpretation of SERS spectra. In addition, multifunctional SERS platforms for pathogen bacteria in matrix are discussed as well. Furthermore, an outlook of the work done and a perspective on the future directions of SERS as a reliable tool for real-time pathogen bacteria detection are given. © 2017 Elsevier B.V.

✓ **لینک** DOI **(استفاده برای دانلود مقاله)**

10.1016/j.bios.2017.02.032

✓ **نام ژورنال:**

Biosensors and Bioelectronics

✓ **سال انتشار:**

2017

✓ **کلیدواژه‌ها:**

Label method; Label-free method; Multifunctional detection platform; Pathogen bacteria; Surface-enhanced Raman scattering

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Surface-Enhanced Raman Spectroscopy as a Tool for Probing Specific Biochemical Components in Bacteria

✓ **نویسندگان:**

Zeiri L., Bronk B.V., Shabtai Y., Eichler J., Efrima S.

✓ **خلاصه پژوهش:**

Treatment of bacteria with silver yields intense and highly specific surface-enhanced Raman spectroscopy (SERS) spectra from various cellular chemical components located in the vicinity of the silver colloids. In particular, we demonstrate an extreme sensitivity to flavin components associated with the cell envelope and to their state of oxidation. Different spectra, possibly associated with DNA, carboxylates, and perhaps phosphates, are obtained from the soluble interior fraction of the cell.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1366/000370204322729441

✓ **نام ژورنال:**

Applied Spectroscopy

✓ **سال انتشار:**

2004

✓ **کلیدواژه‌ها:**

Bacteria; Flavins; Silver colloids; Surface-enhanced Raman scattering

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

Understanding SERS of bacteria

✓ **نویسندگان:**

Efrima S., Zeiri L.

✓ **خلاصه پژوهش:**

Surface-enhanced Raman spectroscopy (SERS) has been suggested as a powerful tool to identify bacteria, draving from its high fingerprint (vibrational) information content, its extreme sensitivity (down to the single molecule level) and its obliviousness to the aqueous environment intrinsic to biological systems. We review here in a comparative manner the various studies that attempted to utilize SERS for this important goal in light of the work carried out by our own group over the past 10 years or so. We show that SERS has an additional major advantage, namely, it introduces a new dimension of selectivity, which, on the one hand, makes it even more suitable as an analytical tool, but on the other hand, it requires gaining control of the precise manner in which the SERS-active metal centers are produced and brought into contact with the micro-organism. Our emphasis in this review is on understanding the spectra in terms of the nature of the SERS-active centers and their placement within the bacterium. On the interpretation and assignment of the spectra, we constantly keep in mind the final goal of bacteria identification. Copyright © 2009 John Wiley & Sons, Ltd.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1002/jrs.2121

✓ **نام ژورنال:**

Journal of Raman Spectroscopy

✓ **سال انتشار:**

2009

✓ **کلیدواژه‌ها:**

Bacteria; Flavins; Raman; SERS

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

On the way to nanometer-sized information of the bacterial surface by tip-enhanced Raman spectroscopy

✓ **نویسندگان:**

Neugebauer U., Rösch P., Schmitt M., Popp J., Julien C., Rasmussen A., Budich C., Deckert V.

✓ **خلاصه پژوهش:**

A straight tip: With tip-enhanced Raman spectroscopy (TERS), chemical and topographical information with nanometric resolution below the diffraction limit of soft biological samples such as bacteria can be gained simultaneously at short measuring times. This noninvasive technique opens new ways for the investigation of many problems in biology and biomedicine. (Graph Presented). © 2006 Wiley-VCH Verlag GmbH & Co. KGaA.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/cphc.200600173

✓ **نام ژورنال:**

ChemPhysChem

✓ **سال انتشار:**

2006

✓ **کلیدواژه‌ها:**

Atomic force microscopy; Bacterial surface; Raman spectroscopy; Surface analysis; Tip-enhanced Raman spectroscopy (TERS)

Detect Precisely

✓ عنوان پژوهش:

Simultaneous capture, detection, and inactivation of bacteria as enabled by a surface-enhanced Raman scattering multifunctional chip

✓ نویسندگان:

Wang H., Zhou Y., Jiang X., Sun B., Zhu Y., Wang H., Su Y., He Y.

✓ خلاصه پژوهش:

Herein, we present a multifunctional chip based on surface-enhanced Raman scattering (SERS) that effectively captures, discriminates, and inactivates pathogenic bacteria. The developed SERS chip is made of a silicon wafer decorated with silver nanoparticles and modified with 4-mercaptophenylboronic acid (4-MPBA). It was prepared in a straightforward manner by chemical reduction assisted by hydrogen fluoride etching, followed by the conjugation of 4-MPBA through Ag-S bonds. The dominant merits of the fabricated SERS chip include excellent reproducibility with a relative standard deviation (RSD) value smaller than 11.0 %, adaptable bacterial-capture efficiency (ca. 60 %) at low concentrations (500-2000 CFU mL-1), a low detection limit (down to a concentration of 1.0×102 cells mL-1), and high antibacterial activity (an antibacterial rate of ca. 97 %). The SERS chip enabled sensitive and specific discrimination of Escherichia coli and Staphylococcus aureus from human blood. No chip off the old block: A multifunctional platform was developed for the simultaneous capture, sensing by surface-enhanced Raman scattering (SERS), and inactivation of bacteria (see picture). The SERS chip featured excellent reproducibility, good bacterial-capture efficiency, high sensitivity, and a high antibacterial rate, and was found to be suitable for capturing and discriminating bacteria in real systems. © 2015 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1002/anie.201412294

✓ نام ژورنال:

Angewandte Chemie - International Edition

✓ سال انتشار:

2015

✓ کلیدواژه‌ها:

bacteria; multifunctional platforms; silicon; silver nanoparticles; surface-enhanced Raman scattering

✓ عنوان پژوهش:

Graphene oxide wrapped SERS tags: Multifunctional platforms toward optical labeling, photothermal ablation of bacteria, and the monitoring of killing effect

✓ نویسندگان:

Lin D., Qin T., Wang Y., Sun X., Chen L.

✓ خلاصه پژوهش:

As novel optical nanoprobes, surface-enhanced Raman scattering (SERS) tags have drawn growing interests in the application of biomedical imaging and phototherapies. Herein, we demonstrated a novel in situ synthesis strategy for GO wrapped gold nanocluster SERS tags by using a tris(2,2′-bipyridyl) ruthenium(II) chloride (Rubpy)/GO nanohybrid as a complex Raman reporter, inspired by the role of GO as an artificial receptor for various dyes. The introduction of GO in the synthesis procedure provided systematic solutions for controlling several key parameters of SERS tags, including reproducibility, sensitivity, and colloidal and signal stability. An additional interesting thermal-sensitive SERS property (SERS intensity decreased upon increasing the temperature) was also achieved due to the heat-induced release/redistribution of reporter molecules adsorbed on GO. Combining the synergic effect of these features, we further fabricated multifunctional, aldehyde group conjugated Au@Rubpy/GO SERS tags for optical labeling and photothermal ablation of bacteria. Sensitive Raman imaging of gram-positive (Staphylococcus aureus) and gram-negative (Escherichia coli) bacteria could be realized, and satisfactory photothermal killing efficacy for both bacteria was achieved. Our results also demonstrated the correlation among the SERS intensity decrease ratio, bacteria survival rate, and the terminal temperature of the tag-bacteria suspension, showing the possibility to use SERS assay to measure antibacterial response during the photothermal process using this tag. © 2013 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/am405396k

✓ نام ژورنال:

ACS Applied Materials and Interfaces

✓ سال انتشار:

2014

✓ کلیدواژه‌ها:

bacteria; gold nanoparticles; graphene oxide; photothermal ablation; SERS tags

✓ **عنوان پژوهش:**

Detection of bacteria by surface-enhanced Raman spectroscopy

✓ **نویسندگان:**

Sengupta A., Mujacic M., Davis E.J.

✓ **خلاصه پژوهش:**

The detection and identification of dilute bacterial samples by surface-enhanced Raman spectroscopy has been explored by mixing aqueous suspensions of bacteria with a suspension of nanocolloidal silver particles. An estimate of the detection limit of E. coli was obtained by varying the concentration of bacteria. By correcting the Raman spectra for the broad librational OH band of water, reproducible spectra were obtained for E. coli concentrations as low as approximately 103 cfu/mL. To aid in the assignment of Raman bands, spectra for E. coli in D2O are also reported. © Springer-Verlag 2006.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1007/s00216-006-0711-z

✓ **نام ژورنال:**

Analytical and Bioanalytical Chemistry

✓ **سال انتشار:**

2006

✓ **کلیدواژه‌ها:**

Bacteria detection; Bacterial pathogens; Raman spectroscopy

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

The biochemical origins of the surface-enhanced Raman spectra of bacteria: a metabolomics profiling by SERS

✓ نویسندگان:

Premasiri W.R., Lee J.C., Sauer-Budge A., Théberge R., Costello C.E., Ziegler L.D.

✓ خلاصه پژوهش:

The dominant molecular species contributing to the surface-enhanced Raman spectroscopy (SERS) spectra of bacteria excited at 785 nm are the metabolites of purine degradation: adenine, hypoxanthine, xanthine, guanine, uric acid, and adenosine monophosphate. These molecules result from the starvation response of the bacterial cells in pure water washes following enrichment from nutrient-rich environments. Vibrational shifts due to isotopic labeling, bacterial SERS spectral fitting, SERS and mass spectrometry analysis of bacterial supernatant, SERS spectra of defined bacterial mutants, and the enzymatic substrate dependence of SERS spectra are used to identify these molecular components. The absence or presence of different degradation/salvage enzymes in the known purine metabolism pathways of these organisms plays a central role in determining the bacterial specificity of these purine-base SERS signatures. These results provide the biochemical basis for the development of SERS as a rapid bacterial diagnostic and illustrate how SERS can be applied more generally for metabolic profiling as a probe of cellular activity. [Figure not available: see fulltext.] © 2016, Springer-Verlag Berlin Heidelberg.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1007/s00216-016-9540-x

✓ نام ژورنال:

Analytical and Bioanalytical Chemistry

✓ سال انتشار:

2016

✓ کلیدواژه‌ها:

Bacteria; Metabolic profiling; Nucleotide degradation; Purine metabolism; Surface-enhanced Raman spectroscopy

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Barcoding bacterial cells: A SERS-based methodology for pathogen identification

✓ **نویسندگان:**

Patel I.S., Premasiri W.R., Moir D.T., Ziegler L.D.

✓ **خلاصه پژوهش:**

A principal component analysis (PCA) based on the sign of the second derivative of the surface-enhanced Raman scattering (SERS) spectrum obtained on in situ grown Au-cluster-covered SiO2 substrates results in improved reproducibility and enhanced specificity for bacterial diagnostics. The barcode-generated clustering results are systematically compared with those obtained from the corresponding spectral intensities, first derivatives and second derivatives for the SERS spectra of closely related cereus group Bacillus strains. PCA plots and the corresponding hierarchical cluster analysis (HCA) dendrograms illustrate the improved bacterial identification resulting from the barcode spectral data reduction. Supervised discriminant function analysis (DFA) plots result in slightly improved group separation but show more susceptibility to false positive classifications than the corresponding PCA contours. In addition, this PCA treatment is used to highlight the enhanced bacterial species specificity observed for SERS as compared to normal bulk (non-SERS) Raman spectra. The identification algorithm described here is critical for the development of SERS microscopy as a rapid, reagentless and portable diagnostic of bacterial pathogens. Copyright © 2008 John Wiley & Sons, Ltd.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/jrs.2064

✓ **نام ژورنال:**

Journal of Raman Spectroscopy

✓ **سال انتشار:**

2008

✓ **کلیدواژه‌ها:**

Bacteria; Principal component analysis; SERS

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Highly sensitive detection of proteins and bacteria in aqueous solution using surface-enhanced raman scattering and optical fibers

✓ **نویسندگان:**

Yang X., Gu C., Qian F., Li Y., Zhang J.Z.

✓ **خلاصه پژوهش:**

We report the detection of the proteins lysozyme and cytochrome c as well as the live bacterial cells of Shewanella oneidensis MR-1 in aqueous solutions with sensitivities order(s) of magnitude higher than those previously reported. Two highly sensitive surface-enhanced Raman scattering (SERS)-based biosensors using optical fibers have been employed for such label-free macromolecule detections. The first sensor is based on a tip-coated multimode fiber (TCMMF) with a double-substrate "sandwich" structure, and a detection limit of 0.2 μg/mL is achieved in protein detections. The second sensor is based on a liquid core photonic crystal fiber (LCPCF) with a better confinement of light inside the fiber core, and a detection limit of 10 6 cells/mL is achieved for the bacteria detection. Both SERS biosensors show great potential for highly sensitive and molecule-specific detection and identification of biomolecules. © 2011 American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/ac200707t

✓ **نام ژورنال:**

Analytical Chemistry

✓ **سال انتشار:**

2011

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ عنوان پژوهش:

A high speed detection platform based on surface-enhanced Raman scattering for monitoring antibiotic-induced chemical changes in bacteria cell wall

✓ نویسندگان:

Liu T.-T., Lin Y.-H., Hung C.-S., Liu T.-J., Chen Y., Huang Y.-C., Tsai T.-H., Wang H.-H., Wang D.-H., Wang J.-K., Wang Y.-L., Lin C.-H.

✓ خلاصه پژوهش:

Rapid and accurate diagnosis for pathogens and their antibiotic susceptibility is critical for controlling bacterial infections. Conventional methods for determining bacterium's sensitivity to antibiotic depend mostly on measuring the change of microbial proliferation in response to the drug. Such "biological assay" inevitably takes time, ranging from days for fast-growing bacteria to weeks for slow-growers. Here, a novel tool has been developed to detect the "chemical features" of bacterial cell wall that enables rapid identification of drug resistant bacteria within hours. The surface-enhanced Raman scattering (SERS) technique based on our newly developed SERS-active substrate was applied to assess the fine structures of the bacterial cell wall. The SERS profiles recorded by such a platform are sensitive and stable, that could readily reflect different bacterial cell walls found in Gram-positive, Gram-negative, or mycobacteria groups. Moreover, characteristic changes in SERS profile were noticed in the drug-sensitive bacteria at the early period (i.e., ~1 hr) of antibiotic exposure, which could be used to differentiate them from the drug-resistant ones. The SERS-based diagnosis could be applied to a single bacterium. The high-speed SERS detection represents a novel approach for microbial diagnostics. The single-bacterium detection capability of SERS makes possible analyses directly on clinical specimen instead of pure cultured bacteria. © 2009 Liu et al.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1371/journal.pone.0005470

✓ نام ژورنال:

PLoS ONE

✓ سال انتشار:

2009

✓ کلیدواژه‌ها:

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Facile Synthesis of Au-Coated Magnetic Nanoparticles and Their Application in Bacteria Detection via a SERS Method

✓ نویسندگان:

Wang J., Wu X., Wang C., Rong Z., Ding H., Li H., Li S., Shao N., Dong P., Xiao R., Wang S.

✓ خلاصه پژوهش:

This study proposes a facile method for synthesis of Au-coated magnetic nanoparticles (AuMNPs) core/shell nanocomposites with nanoscale rough surfaces. MnFe2O4 nanoparticles (NPs) were first modified with a uniform polyethylenimine layer (2 nm) through self-assembly under sonication. The negatively charged Au seeds were then adsorbed on the surface of the MnFe2O4 NPs through electrostatic interaction for Au shell formation. Our newly developed sonochemically assisted hydroxylamine seeding growth method was used to grow the adsorbed gold seeds into large Au nanoparticles (AuNPs) to form a nanoscale rough Au shell. Au-coated magnetic nanoparticles (AuMNPs) were obtained from the intermediate product (Au seeds decorated magnetic core) under sonication within 5 min. The AuMNPs were highly uniform in size and shape and exhibited satisfactory surface-enhanced Raman scattering (SERS) activity and strong magnetic responsivity. PATP was used as a probe molecule to evaluate the SERS performance of the synthesized AuMNPs with a detection limit of 10-9 M. The synthesized AuMNPs were conjugated with Staphylococcus aureus (S. aureus) antibody for bacteria capture and separation. The synthesized plasmonic AuNR-DTNB NPs, whose LSPR wavelength was adjusted to the given laser excitation wavelength (785 nm), were conjugated with S. aureus antibody to form a SERS tag for specific recognition and report of the target bacteria. S. aureus was indirectly detected through SERS based on sandwich-structured immunoassay, with a detection limit of 10 cells/mL. Moreover, the SERS intensity at Raman peak of 1331 cm-1 exhibited a linear relationship to the logarithm of bacteria concentrations ranging from 101 cells/mL to 105 cells/mL. © 2016 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acsami.6b07528

✓ نام ژورنال:

ACS Applied Materials and Interfaces

✓ سال انتشار:

2016

✓ کلیدواژه‌ها:

antibody; Au-coated magnetic nanoparticles; AuNRs; Staphylococcus aureus; surface-enhanced Raman spectroscopy

✓ **عنوان پژوهش:**

Silver nanorod arrays as a surface-enhanced Raman scattering substrate for foodborne pathogenic bacteria detection

✓ **نویسندگان:**

Chu H., Huang Y., Zhao Y.

✓ **خلاصه پژوهش:**

Surface-enhanced Raman scattering (SERS) using novel silver nanorod array substrates has been used for the detection of pathogenic bacteria. The substrate consists of a base layer of 500 nm silver film on a glass slide and a layer of silver nanorod array with a length of ~1 μm produced by the oblique angle deposition method at a vapor incident angle of 86°. Spectra from whole cell bacteria, Generic Escherichia coli, E. coli 0157:H7, E. coli DH 5α, Staphylococcus aureus, S. epidermidis, and Salmonella typhimurium, and bacteria mixtures have been obtained. This SERS active substrate can detect spectral differences between Gram types, different species, their mixture, and strains. Principal component analysis (PCA) has been applied to classify the spectra. Viable and nonviable cells have also been examined, and significantly reduced SERS responses were observed for nonviable cells. SERS detection of bacteria at the single cell level, excited at low incident laser power (12 μW) and short collection time (10 s), has also been demonstrated. These results indicate that the SERS-active silver nanorod array substrate is a potential analytical sensor for rapid identification of microorganisms with a minimum of sample preparation. © 2008 Society for Applied Spectroscopy.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1366/000370208785284330

✓ **نام ژورنال:**

Applied Spectroscopy

✓ **سال انتشار:**

2008

✓ **کلیدواژه‌ها:**

Bacteria; Detection; Nanorods; SERS; Surface-enhanced Raman scattering spectroscopy

✓ **عنوان پژوهش:**

Label-Free in Situ Discrimination of Live and Dead Bacteria by Surface-Enhanced Raman Scattering

✓ **نویسندگان:**

Zhou H., Yang D., Ivleva N.P., Mircescu N.E., Schubert S., Niessner R., Wieser A., Haisch C.

✓ **خلاصه پژوهش:**

Techniques to distinguish between live and dead bacteria in a quantitative manner are in high demand in numerous fields including medical care, food safety, and public security as well as basic science research. This work demonstrates new nanostructures (silver nanoparticles coating bacteria structure, Bacteria@AgNPs) and their utility for rapid counting of live and dead bacteria by surface-enhanced Raman scattering (SERS). We found that suspensions containing Gram-negative organisms as well as AgNPs give strong SERS signals of live bacteria when generated selectively on the particle surface. However, almost no SERS signals can be detected from Bacteria@AgNPs suspensions containing dead bacteria. We demonstrate successful quantification of different percentages of dead bacteria both in bulk liquid and on glass surfaces by using SERS mapping on a single cell basis. Furthermore, different chemicals have been used to elucidate the mechanism involved in this observation. Finally, we used the Bacteria@AgNPs method to detect antibiotic resistance of E. coli strains against several antibiotics used in human medicine. (Figure Presented) © 2015 American Chemical Society.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1021/acs.analchem.5b01271

✓ **نام ژورنال:**

Analytical Chemistry

✓ **سال انتشار:**

2015

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

Bacteria-template synthesized silver microspheres with hollow and porous structures as excellent SERS substrate

✓ **نویسندگان:**

Yang D.-P., Chen S., Huang P., Wang X., Jiang W., Pandoli O., Cui D.

✓ **خلاصه پژوهش:**

Template-driven strategy is widely explored for the synthesis of nano/micro materials. Of all the templates studied, naturally occurring biological systems such as proteins, viruses and bacteria have attracted more attention due to the prolific sources and complex structural diversities. Herein, we report a simple bacteria templated synthesis of silver microspheres over a bottom-up controlled route. These as-prepared silver microspheres not only have narrow size distribution but possess hollow and porous structures. Surface enhanced Raman scattering (SERS) experiments using 2-mercaptopyridine (2-Mpy) as probing molecules show that these hollow porous microspheres can act as excellent substrate for ultrasensitive detecting. The detection limit is as low as 10−15 M and the enhancement factor reaches to 1011. Compared with other conventional SERS substrates, the reproducible, high sensitive and cost-effective Ag microspheres could become an ideal substrate choice for practical SERS application. © 2010 The Royal Society of Chemistry.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/c0gc00431f

✓ **نام ژورنال:**

Green Chemistry

✓ **سال انتشار:**

2010

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Simultaneous detection and quantification of three bacterial meningitis pathogens by SERS

✓ نویسندگان:

Gracie K., Correa E., Mabbott S., Dougan J.A., Graham D., Goodacre R., Faulds K.

✓ خلاصه پژوهش:

Bacterial meningitis is well known for its rapid onset and high mortality rates, therefore rapid detection of bacteria found in cerebral spinal fluid (CSF) and subsequent effective treatment is crucial. A new quantitative assay for detection of three pathogens that result in bacterial meningitis using a combination of lambda exonuclease (λ-exonuclease) and surface enhanced Raman scattering (SERS) is reported. SERS challenges current fluorescent-based detection methods in terms of both sensitivity and more importantly the detection of multiple components in a mixture, which is becoming increasingly more desirable for clinical diagnostics. λ-Exonuclease is a processive enzyme that digests one strand of double stranded DNA bearing a terminal 5′-phosphate group. The new assay format involves the simultaneous hybridisation of two complementary DNA probes (one containing a SERS active dye) to a target sequence followed by λ-exonuclease digestion of double stranded DNA and SERS detection of the digestion product. Three meningitis pathogens were successfully quantified in a multiplexed test with calculated limits of detection in the pico-molar range, eliminating the need for time consuming culture based methods that are currently used for analysis. Quantification of each individual pathogen in a mixture using SERS is complex, however, this is the first report that this is possible using the unique spectral features of the SERS signals combined with partial least squares (PLS) regression. This is a powerful demonstration of the ability of this SERS assay to be used for analysis of clinically relevant targets with significant advantages over existing approaches and offers the opportunity for future deployment in healthcare applications. © The Royal Society of Chemistry 2014.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1039/c3sc52875h

✓ نام ژورنال:

Chemical Science

✓ سال انتشار:

2014

✓ کلیدواژه‌ها:

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Convective assembly of bacteria for surface-enhanced Raman scattering

✓ **نویسندگان:**

Kahraman M., Yazici M.M., Şahin F., Çulha M.

✓ **خلاصه پژوهش:**

A sample preparation method based on convective assembly for "whole-microorganism" identification using surface-enhanced Raman scattering (SERS) is developed. With this technique, a uniform sample can easily be prepared with silver nanoparticles. During the deposition process, bacteria and nanoparticles are assembled to form a unique wellordered structure with great reproducibility. The SERS spectra acquired from the samples prepared with this technique have better quality and improved reproducibility for SERS spectra obtained from the same sample and limited variation due to the consistent sample preparation. E. coli, a Gram-negative bacilli, and Staphylococcus cohnii, a Gram-positive coccus, are studied as model bacteria. © 2008 American Chemical Society.

✓ **لینک** DOI **(استفاده برای دانلود مقاله)**

10.1021/la702240q

✓ **نام ژورنال:**

Langmuir

✓ **سال انتشار:**

2008

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Portable, quantitative detection of bacillus bacterial spores using surface-enhanced raman scattering

✓ نویسندگان:

Cowcher D.P., Xu Y., Goodacre R.

✓ خلاصه پژوهش:

Portable rapid detection of pathogenic bacteria such as Bacillus is highly desirable for safety in food manufacture and under the current heightened risk of biological terrorism. Surface-enhanced Raman scattering (SERS) is becoming the preferred analytical technique for bacterial detection, due to its speed of analysis and high sensitivity. However in seeking methods offering the lowest limits of detection, the current research has tended toward highly confocal, microscopy-based analysis, which requires somewhat bulky instrumentation and precisely synthesized SERS substrates. By contrast, in this study we have improved SERS for bacterial analyses using silver colloidal substrates, which are easily and cheaply synthesized in bulk, and which we shall demonstrate permit analysis using portable instrumentation. All analyses were conducted in triplicate to assess the reproducibility of this approach, which was excellent. We demonstrate that SERS is able to detect and quantify rapidly the dipicolinate (DPA) biomarker for Bacillus spores at 5 ppb (29.9 nM) levels which are significantly lower than those previously reported for SERS and well below the infective dose of 104B. anthracis cells for inhalation anthrax. Finally we show the potential of multivariate data analysis to improve detection levels in complex DPA extracts from viable spores. © 2013 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/ac303657k

✓ نام ژورنال:

Analytical Chemistry

✓ سال انتشار:

2013

✓ کلیدواژه‌ها:

✓ عنوان پژوهش:

Layer-by-layer coating of bacteria with noble metal nanoparticles for surface-enhanced Raman scattering

✓ نویسندگان:

Kahraman M., Zamaleeva A.I., Fakhrullin R.F., Culha M.

✓ خلاصه پژوهش:

A simple layer-by-layer method to coat the bacterial cells with gold and silver nanoparticles (AuNPs and AgNPs) for the acquisition of surface-enhanced Raman scattering (SERS) spectra is reported. First, the bacteria cell wall is coated with poly (allylamine hydrochloride) (PAH), a positively charged polymer, and then with citrate reduced Au or AgNPs. In order to increase the stability of the coating, another layer of PAH is prepared on the surface. The SEM and AFM images indicate that the nanoparticles are in the form of both isolated and aggregated nanoparticles on the bacterial wall. The coating of bacterial cells with AgNPs or AuNPs not only serves for their preparation for SERS measurement but also helps to visualize the coated of bacterial cells under the ordinary white-light microscope objective due to efficient light-scattering properties of Au and AgNPs. A comparative study single versus aggregates of bacterial cells is also demonstrated for possible single bacterial detection with SERS. The two bacteria that differ in shape and cell wall biochemical structure, Escherichia coli and Staphylococcus cohnii, Gram-negative and -positive, respectively, are used as models. The preliminary results reveal that the approach could be used for single bacterial cell identification. © 2009 Springer-Verlag.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1007/s00216-009-3159-0

✓ نام ژورنال:

Analytical and Bioanalytical Chemistry

✓ سال انتشار:

2009

✓ کلیدواژه‌ها:

Gold and silver nanoparticles; Layer-by-layer; SERS; Single bacterium

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Surface-enhanced Raman spectroscopy of bacteria and pollen

✓ **نویسندگان:**

Sengupta A., Laucks M.L., James Davis E.

✓ **خلاصه پژوهش:**

A technique for distinguishing biological material based on surface-enhanced Raman scattering (SERS) is reported in this work. Of particular interest is biological material that can be airborne. Silver colloidal particles with diameters in the range 10 to 20 nm and with a characteristic ultraviolet-visible (UV-VIS) absorption band at 400 nm were used to obtain SERS spectra of Escherichia coll, Pseudomonas aeruginosa, and Salmonella typhimurium bacteria and a number of tree and grass pollens (Cupressus arizonica (cypress), Sequoia sempervlrens (redwood), Populus deltoides (cottonwood), Poa pratensis (Kentucky bluegrass), and Anthoxanthum odoratum (sweet vernal grass)). While differences in the SERS spectra among the bacteria were small, we found that the pollen spectra we analyzed could readily be distinguished from the bacteria spectra, and there were significant differences between pollen from different families. In order to obtain reproducible results, we studied the parameters controlling the interaction between the analyte and the nanoscale metallic surface. Our results show that the volume ratio of analyte to colloidal particles must be within a narrow range of values to optimize the signal-to-noise ratio of the SERS spectra and minimize the fluorescence from the analyte. Also, we found that the time-dependent behavior of colloidal/bacterial suspensions (or adsorption rate of the silver colloid particles on the bacteria) is strongly dependent on pH, density of bacteria in solution, and even, to some extent, the type-of bacteria. © 2005 Society for Applied Spectroscopy.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1366/0003702054615124

✓ **نام ژورنال:**

Applied Spectroscopy

✓ **سال انتشار:**

2005

✓ **کلیدواژه‌ها:**

Bacteria; Bio-aerosols; Pollen; SERS; Surface-enhanced Raman spectroscopy

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

Surface-enhanced raman scattering from intracellular and extracellular bacterial locations

✓ **نویسندگان:**

Jarvis R.M., Law N., Shadi I.T., O'Brien P., Lloyd J.R., Goodacre R.

✓ **خلاصه پژوهش:**

While surface-enhanced Raman scattering (SERS) can increase the Raman cross-section by 4-6 orders of magnitude, for SERS to be effective it is necessary for me analyte to be either chemically bonded or within close proximity to the metal surface used. Therefore most studies investigating the biochemical constituents of microorganisms have introduced an external supply of gold or silver nanoparticles. As a consequence, me study of bacteria by SERS has to date been focused almost exclusively on the extracellular analysis of the Gram-negative outer cell membrane. Bacterial cells typically measure as little as 0.5 by 1 μm, and it is difficult to introduce a nanometer sized colloidal metal particle into this tiny environment. However, dissimilatory metal-reducing bacteria, including Shewanella and Geobacter species, can reduce a wide range of high valence metal ions, often within the cell, and for Ag(I) and Au(III) this can result in the formation of colloidal zero-valent particles. Here we report, for the first time, SERS of the bacterium Geobacter sulfurreducens facilitated by colloidal gold particles precipitated within the cell. In addition, we show SERS from the same organism following reduction of ionic silver, which results in colloidal silver depositions on the cell surface. © 2008 American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/ac800838v

✓ **نام ژورنال:**

Analytical Chemistry

✓ **سال انتشار:**

2008

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Multifunctional magnetic-plasmonic nanoparticles for fast concentration and sensitive detection of bacteria using SERS

✓ **نویسندگان:**

Zhang L., Xu J., Mi L., Gong H., Jiang S., Yu Q.

✓ **خلاصه پژوهش:**

Multifunctional magnetic-plasmonic Fe 3O 4-Au core-shell nanoparticles (Au-MNPs) were prepared for simultaneous fast concentration of bacterial cells by applying an external point magnetic field, and sensitive detection and identification of bacteria using surface-enhanced Raman spectroscopy (SERS). We demonstrated that a spread of a 10μL drop of a mixture of 10 5cfu/mL bacteria and 3μg/mL Au-MNPs on a silicon surface can be effectively condensed into a highly compact dot within 5min by applying an external point magnetic field, resulting in 60 times more concentrated bacteria in the dot area than on the spread area without concentration. Surrounded by dense uniformly packed Au-MNPs, bacteria can be sensitively and reproducibly detected directly using SERS. The principle component analysis (PCA) showed that three different Gram-negative bacterial strains can be clearly differentiated. We also demonstrated that the condensed multifunctional Au-MNPs dot can be used as a highly sensitive SERS-active substrate and a limit of detection better than 0.1ppb was obtained in detection of small molecules such as 4-mercaptopyrine. This novel platform significantly simplifies the concentration and detection process, which holds great promise for applications in food safety, environmental monitoring, medical diagnoses, and chemical and biological threat detections. © 2011 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.bios.2011.10.006

✓ **نام ژورنال:**

Biosensors and Bioelectronics

✓ **سال انتشار:**

2012

✓ **کلیدواژه‌ها:**

Bacteria detection; Magnetic concentration; Multifunctional nanoparticles; SERS

✓ **عنوان پژوهش:**

Engineering nanoparticle cluster arrays for bacterial biosensing: The role of the building block in multiscale SERS substrates

✓ **نویسندگان:**

Yang L., Yan B., Premasiri W.R., Ziegler L.D., Negro L.D., Reinhard B.M.

✓ **خلاصه پژوهش:**

Noble metal nanoparticle cluster arrays (NCAs) area novel class of engineered substrates for surface enhanced Raman spectroscopy (SERS), in which the noble metal nanoparticles interact on multiple length scales to create a multiscale E-field cascade enhancement. In this work the role of the building block for the NCA performance is quantified. Periodic NCAs with constant cluster diameter (D = 200 nm) but variable nanoparticle diameter (d) and intercluster separation (A) were assembled on glass and their optical response and SERS enhancement were systematically characterized as a function of D, Λ, and d. An increase of d from 40 to 80 n m and simultaneous decrease of A from 200 to 50 nm led to an improvement of the ensemble averaged SERS enhancement factor by a factor of up to ~8. The coefficient of variation (cv) of the enhancement factors (G) is significantly lower for the d = 80 nm NCAs than for the d = 40 nm and d = 60 nm NCAs. Optimized (D = 200 nm, Λ = 50 nm, d = 80 nm) NCAs show the overall highest signal reproducibility of all investigated NCAs and random nanoparticle substrates and achieve effective single cell detection sensitivity. © 2010 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/adfm.201000630

✓ **نام ژورنال:**

Advanced Functional Materials

✓ **سال انتشار:**

2010

✓ **کلیدواژه‌ها:**

✓ **عنوان پژوهش:**

Nanostructured silver-gold bimetallic SERS substrates for selective identification of bacteria in human blood

✓ **نویسندگان:**

Sivanesan A., Witkowska E., Adamkiewicz W., Dziewit Ł., Kamińska A., Waluk J.

✓ **خلاصه پژوهش:**

Surface-enhanced Raman spectroscopy (SERS) is a potentially important tool in the rapid and accurate detection of pathogenic bacteria in biological fluids. However, for diagnostic application of this technique, it is necessary to develop a highly sensitive, stable, biocompatible and reproducible SERS-active substrate. In this work, we have developed a silver-gold bimetallic SERS surface by a simple potentiostatic electrodeposition of a thin gold layer on an electrochemically roughened nanoscopic silver substrate. The resultant substrate was very stable under atmospheric conditions and exhibited the strong Raman enhancement with the high reproducibility of the recorded SERS spectra of bacteria (E. coli, S. enterica, S. epidermidis, and B. megaterium). The coating of the antibiotic over the SERS substrate selectively captured bacteria from blood samples and also increased the Raman signal in contrast to the bare surface. Finally, we have utilized the antibiotic-coated hybrid surface to selectively identify different pathogenic bacteria, namely E. coli, S. enterica and S. epidermidis from blood samples. © 2014 The Royal Society of Chemistry.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1039/c3an01924a

✓ **نام ژورنال:**

Analyst

✓ **سال انتشار:**

2014

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Rapid detection of food- and waterborne bacteria using surface-enhanced Raman spectroscopy coupled with silver nanosubstrates

✓ نویسندگان:

Fan C., Hu Z., Mustapha A., Lin M.

✓ خلاصه پژوهش:

Development of rapid and sensitive methods to detect pathogens is important to food and water safety. This study aimed to detect and discriminate important food- and waterborne bacteria (i.e., Escherichia coli O157:H7, Staphylococcus epidermidis, Listeria monocytogenes, and Enterococcus faecelis) by surface-enhanced Raman spectroscopy (SERS) coupled with intracellular nanosilver as SERS substrates. An in vivo molecular probing using intracellular nanosilver for the preparation of bacterial samples was established and assessed. Satisfactory SERS performance and characteristic SERS spectra were obtained from different bacterial samples. Distinctive differences were observed in SERS spectral data, specifically in the Raman shift region of 500-1,800 cm -1, and between bacterial samples at the species and strain levels. The detection limit of SERS coupled with in vivo molecular probing using silver nanosubstrates could reach the level of single cells. Experiments with a mixture of E. coli O157:H7 and S. epidermidis for SERS measurement demonstrate that SERS could be used for classification of mixed bacterial samples. Transmission electron microscopy was used to characterize changes of morphology and cellular composition of bacterial cells after treatment of intracellular nanosilver. The results indicate that SERS coupled with intracellular silver nanosubstrates is a promising method for detection and characterization of food- and waterborne pathogenic and non-pathogenic bacterial samples. © 2011 Springer-Verlag.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1007/s00253-011-3634-3

✓ نام ژورنال:

Applied Microbiology and Biotechnology

✓ سال انتشار:

2011

✓ کلیدواژه‌ها:

Bacteria; Detection; SERS; Silver nanosubstrates

✓ عنوان پژوهش:

Popcorn-shaped magnetic core-plasmonic shell multifunctional nanoparticles for the targeted magnetic separation and enrichment, label-free SERS imaging, and photothermal destruction of multidrug-resistant bacteria

✓ نویسندگان:

Fan Z., Senapati D., Khan S.A., Singh A.K., Hamme A., Yust B., Sardar D., Ray P.C.

✓ خلاصه پژوهش:

Over the last few years, one of the most important and complex problems facing our society is treating infectious diseases caused by multidrug-resistant bacteria (MDRB), by using current market-existing antibiotics. Driven by this need, we report for the first time the development of the multifunctional popcorn-shaped iron magnetic core-gold plasmonic shell nanotechnology-driven approach for targeted magnetic separation and enrichment, label-free surface-enhanced Raman spectroscopy (SERS) detection, and the selective photothermal destruction of MDR Salmonella DT104. Due to the presence of the "lightning-rod effect", the core-shell popcorn-shaped gold-nanoparticle tips provided a huge field of SERS enhancement. The experimental data show that the M3038 antibody-conjugated nanoparticles can be used for targeted separation and SERS imaging of MDR Salmonella DT104. A targeted photothermal-lysis experiment, by using 670 nm light at 1.5 W cm -2 for 10 min, results in selective and irreparable cellular-damage to MDR Salmonella. We discuss the possible mechanism and operating principle for the targeted separation, label-free SERS imaging, and photothermal destruction of MDRB by using the popcorn-shaped magnetic/plasmonic nanotechnology. © 2013 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1002/chem.201202948

✓ نام ژورنال:

Chemistry - A European Journal

✓ سال انتشار:

2013

✓ کلیدواژه‌ها:

gold; iron; magnetic properties; multidrug-resistant bacteria; nanoparticles

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Highly sensitive detection of high-risk bacterial pathogens using SERS-based lateral flow assay strips

✓ **نویسندگان:**

Wang R., Kim K., Choi N., Wang X., Lee J., Jeon J.H., Rhie G.-E., Choo J.

✓ **خلاصه پژوهش:**

Bacterial pathogens such as Yersinia pestis, Francisella tularensis, and Bacillus anthracis are classified into the highest rank of potential bioterrorism agents. Colorimetric lateral flow assay (LFA) strips are commercially available but these conventional strips have drawbacks in terms of low sensitivity and limit of quantitative analysis. Therefore, there is an urgent need for a new sensing platform to detect these pathogens in the early contamination stage. In this study, a novel surface-enhanced Raman scattering (SERS)-based LFA strip was developed for sensitive detection of bacterial pathogens. Target-specific SERS nanotags (Raman reporter-labeled gold nanoparticles) were used as an alternative to the gold nanoparticles in conventional LFA strips. Using these SERS nanotags the presence of bacteria could be identified through a simple color change in the test line. Additionally, highly sensitive and accurate quantitative analysis could be performed by monitoring the characteristic Raman peak intensity of SERS nanotags that were captured in the test line. This highly sensitive method required a short assay time (15 min) and a tiny volume of pathogen sample (40 μL). We believe that the proposed SERS-based LFA technique has great potential as a valuable tool in the early detection of specific bacterial pathogens in the field due to its excellent analytical sensitivity. © 2018 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.snb.2018.04.162

✓ **نام ژورنال:**

Sensors and Actuators, B: Chemical

✓ **سال انتشار:**

2018

✓ **کلیدواژه‌ها:**

Bacillus anthracis; Francisella tularensis; Lateral flow assay; Surface-enhanced Raman scattering; Yersinia pestis

✓ **عنوان پژوهش:**

Mechanistic and physiological consequences of HPr(ser) phosphorylation on the activities of the phosphoenolpyruvate:sugar phosphotransferase system in gram-positive bacteria: Studies with site-specific mutants of HPr

✓ **نویسندگان:**

Reizer J., Sutrina S.L., Saier Jr. M.H., Stewart G.C., Peterkofsky A., Reddy P.

✓ **خلاصه پژوهش:**

The bacterial phosphotransferase system (PTS) catalyzes the transport and phosphorylation of its sugar substrates. The protein-kinase-catalyzed phosphorylation of serine 46 in the phosphocarrier protein, HPr, inhibits PTS activity, but neither the mechanism of this inhibition nor its physiological significance is known. Site-specific HPr mutants were constructed in which serine 46 was replaced by alanine (S46A), threonine (S46T), tyrosine (S46Y) or aspartate (S46D). The purified S46D protein exhibited markedly lower V(max) and higher K(m) values than the wild-type, S46T or S46A protein for the phosphoryl transfer reactions involving HPr(His~P). Interactions of HPr with the enzymes catalyzing phosphoryl transfer to and from HPr regulated the kinase-catalyzed reaction. These results establish the inhibitory effect of a negative charge at position 46 on PTS-mediated phosphoryl transfer and suggest that HPr is phosphorylated on both histidyl and seryl residues by enzymes that recognize its tertiary rather than its primary structure. In vivo studies showed that a negative charge on residue 46 of HPr strongly inhibits PTS-mediated sugar uptake, but that competition of two PTS permeases for HPr(His~P) is quantitatively more important to the regulation of PTS function than serine 46 phosphorylation.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/j.1460-2075.1989.tb03620.x

✓ **نام ژورنال:**

EMBO Journal

✓ **سال انتشار:**

1989

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Antimicrobial peptide based magnetic recognition elements and Au@Ag-GO SERS tags with stable internal standards: A three in one biosensor for isolation, discrimination and killing of multiple bacteria in whole blood

✓ نویسندگان:

Yuan K., Mei Q., Guo X., Xu Y., Yang D., Sánchez B.J., Sheng B., Liu C., Hu Z., Yu G., Ma H., Gao H., Haisch C., Niessner R., Jiang Z., Zhou H.

✓ خلاصه پژوهش:

In this study, a new biosensor based on a sandwich structure has been developed for the isolation and detection of multiple bacterial pathogens via magnetic separation and SERS tags. This novel assay relies on antimicrobial peptide (AMP) functionalized magnetic nanoparticles as "capturing" probes for bacteria isolation and gold coated silver decorated graphene oxide (Au@Ag-GO) nanocomposites modified with 4-mercaptophenylboronic acid (4-MPBA) as SERS tags. When different kinds of bacterial pathogens are combined with the SERS tags, the "fingerprints" of 4-MPBA show corresponding changes due to the recognition interaction between 4-MPBA and different kinds of bacterial cell wall. Compared with the label-free SERS detection of bacteria, 4-MPBA here can be used as an internal standard (IS) to correct the SERS intensities with high reproducibility, as well as a Raman signal reporter to enhance the sensitivity and amplify the differences among the bacterial "fingerprints". Thus, three bacterial pathogens (Escherichia coli, Staphylococcus aureus and Pseudomonas aeruginosa) were successfully isolated and detected, with the lowest concentration for each of the strains detected at just 101 colony forming units per mL (CFU mL-1). According to the changes in the "fingerprints" of 4-MPBA, three bacterial strains were successfully discriminated using discriminant analysis (DA). In addition, the AMP modified Fe3O4NPs feature high antibacterial activities, and can act as antibacterial agents with low cellular toxicology in the long-term storage of blood for future safe blood transfusion applications. More importantly, this novel method can be applied in the detection of bacteria from clinical patients who are infected with bacteria. In the validation analysis, 97.3% of the real blood samples (39 patients) could be classified effectively (only one patient infected with E. coli was misclassified). The multifunctional biosensor presented here allows for the simultaneous isolation, discrimination and killing of bacteria, suggesting its high potential for clinical diagnosis and safe blood transfusions. © The Royal Society of Chemistry.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1039/c8sc04637a

✓ نام ژورنال:

Chemical Science

✓ سال انتشار:

2018

✓ کلیدواژه‌ها:

✓ عنوان پژوهش:

Reproducible surface-enhanced Raman scattering spectra of bacteria on aggregated silver nanoparticles

✓ نویسندگان:

Kahraman M., Yazici M.M., Şahin F., Bayrak Ö.F., Çulha M.

✓ خلاصه پژوهش:

Surface-enhanced Raman scattering (SERS) is proven to be a powerful technique for rapid identification and discrimination of microorganisms. However, due to the heterogeneous nature of the samples, the acquisition of reproducible spectra hinders the further development of the technique. In this study, we demonstrate the influence of the experimental conditions on SERS spectra. Then, we report a simple sample preparation method coupled with a light microscope attached to a Raman spectrometer to find a proper spot on the sample to acquire reproducible SERS spectra. This method utilizes the excited surface plasmons of the aggregated silver nanoparticles to visualize the spots on the sample. The samples are prepared using the concentrated silver colloidal solutions. The collection time for one spectrum is 10 s and each spectrum is a very good representative of the other spectra acquired from the same sample. The nature of the surface charge of the silver nanoparticles influences the spectral features by determining the strength of the interactions between nanoparticles and bacteria and the aggregation properties of the nanoparticles. Although increasing the colloid concentration in the sample resulted in reproducible spectra from arbitrary points on the sample, a great variation from sample to sample prepared with the different colloidal solution concentrations is observed. © 2007 Society for Applied Spectroscopy.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1366/000370207780807731

✓ نام ژورنال:

Applied Spectroscopy

✓ سال انتشار:

2007

✓ کلیدواژه‌ها:

Bacteria; Colloid; Nanoparticle; Plasmon; Raman scattering; SERS; Surface-enhanced Raman scattering

✓ **عنوان پژوهش:**

Ser/Thr phosphorylation as a regulatory mechanism in bacteria

✓ **نویسندگان:**

Dworkin J.

✓ **خلاصه پژوهش:**

This review will discuss some recent work describing the role of Ser/Thr phosphorylation as a post-translational mechanism of regulation in bacteria. I will discuss the interaction between bacterial eukaryotic-like Ser/Thr kinases (eSTKs) and two-component systems as well as hints as to physiological function of eSTKs and their cognate eukaryotic-like phosphatases (eSTPs). In particular, I will highlight the role of eSTKs and eSTPs in the regulation of peptidoglycan metabolism and protein synthesis. In addition, I will discuss how data from phosphoproteomic surveys suggest that Ser/Thr phosphorylation plays a much more significant physiological role than would be predicted simply based on in vivo and in vitro analyses of individual kinases. © 2015 Elsevier Ltd.

✓ **لینک** DOI **(استفاده برای دانلود مقاله)**

10.1016/j.mib.2015.01.005

✓ **نام ژورنال:**

Current Opinion in Microbiology

✓ **سال انتشار:**

2015

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

Comparison of psychro-active arctic marine bacteria and common mesophillic bacteria using surface-enhanced raman spectroscopy

✓ **نویسندگان:**

Laucks M.L., Sengupta A., Junge K., Davis E.J., Swanson B.D.

✓ **خلاصه پژوهش:**

Psychro-active bacteria, important constituents of polar ecosystems, have a unique ability to remain active at temperatures below 0°C, yet it is not known to what extent the composition of their outer cell surfaces aids in their low-temperature viability. In this study, aqueous suspensions of five strains of Arctic psychro-active marine bacteria (PAMB) (mostly sea-ice isolates), were characterized by surface-enhanced Raman spectroscopy (SERS) and compared with SERS spectra from E. coli and P. aerigunosa. We find the SERS spectra of the five psychro-active bacterial strains are similar within experimental reproducibility. However, these spectra are significantly different from the spectra of P. aeruginosa and E. coli. We find that the relative intensities of many of the common peaks show the largest differences reported so far for bacterial samples. An indication of a peak was found in the PAMB spectra that has been identified as characteristic of unsaturated fatty acids and suggests that the outer membranes of the PAMB may contain unsaturated fatty acids. We find that using suspensions of silver colloid particles greatly intensifies the Raman peaks and quenches the fluorescence from bacterial samples. This technique is useful for examination of specific biochemical differences among bacteria. © 2005 Society for Applied Spectroscopy.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1366/000370205774430891

✓ **نام ژورنال:**

Applied Spectroscopy

✓ **سال انتشار:**

2005

✓ **کلیدواژه‌ها:**

Colwellia bacteria; Escherichia coli bacteria; Mesophilic bacteria; Pseudoalteromonas bacteria; Pseudomonas aeruginosa bacteria; Psychro-active bacteria; SERS; Shewanella bacteria; Silver colloid particles; Surface-enhanced Raman spectroscopy

✓ عنوان پژوهش:

Crystal structure of a bacterial signal peptidase apoenzyme. Implications for signal peptide binding and the Ser-Lys dyad mechanism

✓ نویسندگان:

Paetzel M., Dalbey R.E., Strynadka N.C.J.

✓ خلاصه پژوهش:

We report here the x-ray crystal structure of a soluble catalytically active fragment of the Escherichia coli type I signal peptidase (SPase-(A2-75)) in the absence of inhibitor or substrate (apoenzyme). The structure was solved by molecular replacement and refined to 2.4 Å resolution in a different space group (P41212) from that of the previously published acyl-enzyme inhibitor-bound structure (P21212) (Paetzel, M., Dalbey, R. E., and Strynadka, N. C. J. (1998) Nature 396, 186-190). A comparison with the acyl-enzyme structure shows significant side-chain and main-chain differences in the binding site and active site regions, which result in a smaller S1 binding pocket in the apoenzyme. The apoenzyme structure is consistent with SPase utilizing an unusual oxyanion hole containing one side-chain hydroxyl hydrogen (Ser-88 OγH) and one main-chain amide hydrogen (Ser-90 NH). Analysis of the apoenzyme active site reveals a potential deacylating water that was displaced by the inhibitor. It has been proposed that SPase utilizes a Ser-Lys dyad mechanism in the cleavage reaction. A similar mechanism has been proposed for the LexA family of proteases. A structural comparison of SPase and members of the LexA family of proteases reveals a difference in the side-chain orientation for the general base lysine, both of which are stabilized by an adjacent hydroxyl group. To gain insight into how signal peptidase recognizes its substrates, we have modeled a signal peptide into the binding site of SPase. The model is built based on the recently solved crystal structure of the analogous enzyme LexA (Luo, Y., Pfuetzner, R. A., Mosimann, S., Paetzel, M., Frey, E. A., Cherney, M., Kim, B., Little, J. W., and Strynadka, N. C. J. (2001) Cell 106, 1-10) with its bound cleavage site region.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1074/jbc.M110983200

✓ نام ژورنال:

Journal of Biological Chemistry

✓ سال انتشار:

2002

✓ کلیدواژه‌ها:

✓ عنوان پژوهش:

A rapid SERS method for label-free bacteria detection using polyethylenimine-modified Au-coated magnetic microspheres and Au@Ag nanoparticles

✓ نویسندگان:

Wang C., Wang J., Li M., Qu X., Zhang K., Rong Z., Xiao R., Wang S.

✓ خلاصه پژوهش:

A rapid, sensitive, and label-free SERS detection method for bacteria pathogens is reported for the first time. The method, which is based on the combination of polyethylenimine (PEI)-modified Au-coated magnetic microspheres (Fe3O4@Au@PEI) and concentrated Au@Ag nanoparticles (NPs), was named the capture-enrichment-enhancement (CEE) three-step method. A novel Fe3O4@Au microsphere with monodispersity and strong magnetic responsiveness was synthesized as a magnetic SERS substrate and amino functionalized by PEI self-assembly. The negatively charged bacteria were quickly captured and enriched by the positively charged Fe3O4@Au@PEI microspheres, and the bacteria SERS signal was synergistically enhanced by using Fe3O4@Au@PEI microspheres and Au@Ag NPs in conjunction. The CEE three-step method proved useful in tap water and milk samples, and the total assay time required was only 10 min. Results further demonstrated that the CEE three-step method could be a common approach for detecting a wide range of bacteria, as verified by its detection of the Gram-positive bacterium E. coli and Gram-positive bacterium S. aureus at a detection limit of as low as 103 cells per mL. Therefore, our CEE three-step method offered the significant advantages of short assay time, simple operating procedure, and higher sensitivity than previously reported methods of SERS-based bacteria detection. © The Royal Society of Chemistry 2016.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1039/c6an01105e

✓ نام ژورنال:

Analyst

✓ سال انتشار:

2016

✓ کلیدواژه‌ها:

✓ **عنوان پژوهش:**

The Ser/Thr protein kinase AfsK regulates polar growth and hyphal branching in the filamentous bacteria Streptomyces

✓ **نویسندگان:**

Hempel A.M., Cantlay S., Molle V., Wang S.-B., Naldrett M.J., Parker J.L., Richards D.M., Jung Y.-G., Buttner M.J., Flärdh K.

✓ **خلاصه پژوهش:**

In cells that exhibit apical growth, mechanisms that regulate cell polarity are crucial for determination of cellular shape and for the adaptation of growth to intrinsic and extrinsic cues. Broadly conserved pathways control cell polarity in eukaryotes, but less is known about polarly growing prokaryotes. An evolutionarily ancient form of apical growth is found in the filamentous bacteria Streptomyces, and is directed by a polarisome-like complex involving the essential protein DivIVA. We report here that this bacterial polarization machinery is regulated by a eukaryotic-type Ser/Thr protein kinase, AfsK, which localizes to hyphal tips and phosphorylates DivIVA. During normal growth, AfsK regulates hyphal branching by modulating branch-site selection and some aspect of the underlying polarisome-splitting mechanism that controls branching of Streptomyces hyphae. Further, AfsK is activated by signals generated by the arrest of cell wall synthesis and directly communicates this to the polarisome by hyperphosphorylating DivIVA. Induction of high levels of DivIVA phosphorylation by using a constitutively active mutant AfsK causes disassembly of apical polarisomes, followed by establishment of multiple hyphal branches elsewhere in the cell, revealing a profound impact of this kinase on growth polarity. The function of AfsK is reminiscent of the phoshorylation of polarity proteins and polarisome components by Ser/Thr protein kinases in eukaryotes.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1073/pnas.1207409109

✓ **نام ژورنال:**

Proceedings of the National Academy of Sciences of the United States of America

✓ **سال انتشار:**

2012

✓ **کلیدواژه‌ها:**

Cytoskeleton; Hyphal growth; Peptidoglycan; Protein phosphorylation; Tip extension

✓ عنوان پژوهش:

Structure of the bacteriophage λ Ser/Thr protein phosphatase with sulfate ion bound in two coordination modes

✓ نویسندگان:

Voegtli W.C., White D.J., Reiter N.J., Rusnak F., Rosenzweig A.C.

✓ خلاصه پژوهش:

The protein phosphatase encoded by bacteriophage λ (λPP) belongs to a family of Ser/Thr phosphatases (Ser/Thr PPases) that includes the eukaryotic protein phosphatases 1 (PP1), 2A (PP2A), and 2B (calcineurin). These Ser/Thr PPases and the related purple acid phosphatases (PAPs) contain a conserved phosphoesterase sequence motif that binds a dinuclear metal center. The mechanisms of phosphoester hydrolysis by these enzymes are beginning to be unraveled. To utilize λPP more effectively as a model for probing the catalytic mechanism of the Ser/Thr PPases, we have determined its crystal structure to 2.15 Å resolution. The overall fold resembles that of PP1 and calcineurin, including a conserved βαβαβ structure that comprises the phosphoesterase motif. Substrates and inhibitors probably bind in a narrow surface groove that houses the active site dinuclear Mn(II) center. The arrangement of metal ligands is similar to that in PP1, calcineurin, and PAP, and a bound sulfate ion is present in two novel coordination modes. In two of the three molecules in the crystallographic asymmetric unit, sulfate is coordinated to Mn2 in a monodentate, terminal fashion, and the two Mn(II) ions are bridged by a solvent molecule. Two additional solvent molecules are coordinated to Mn1. In the third molecule, the sulfate ion is triply coordinated to the metal center with one oxygen coordinated to both Mn(II) ions, one oxygen coordinated to Mn1, and one oxygen coordinated to Mn2. The sulfate in this coordination mode displaces the bridging ligand and one of the terminal solvent ligands. In both sulfate coordination modes, the sulfate ion is stabilized by hydrogen bonding interactions with conserved arginine residues, Arg 53 and Arg 162. The two different active site structures provide models for intermediates, in phosphoester hydrolysis and suggest specific mechanistic roles for conserved residues.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/bi0021030

✓ نام ژورنال:

Biochemistry

✓ سال انتشار:

2000

✓ کلیدواژه‌ها:

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Rapid bacterial antibiotic susceptibility test based on simple surface-enhanced Raman spectroscopic biomarkers

✓ **نویسندگان:**

Liu C.-Y., Han Y.-Y., Shih P.-H., Lian W.-N., Wang H.-H., Lin C.-H., Hsueh P.-R., Wang J.-K., Wang Y.-L.

✓ **خلاصه پژوهش:**

Rapid bacterial antibiotic susceptibility test (AST) and minimum inhibitory concentration (MIC) measurement are important to help reduce the widespread misuse of antibiotics and alleviate the growing drug-resistance problem. We discovered that, when a susceptible strain of Staphylococcus aureus or Escherichia coli is exposed to an antibiotic, the intensity of specific biomarkers in its surface-enhanced Raman scattering (SERS) spectra drops evidently in two hours. The discovery has been exploited for rapid AST and MIC determination of methicillin-susceptible S. aureus and wild-type E. coli as well as clinical isolates. The results obtained by this SERS-AST method were consistent with that by the standard incubation-based method, indicating its high potential to supplement or replace existing time-consuming methods and help mitigate the challenge of drug resistance in clinical microbiology.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1038/srep23375

✓ **نام ژورنال:**

Scientific Reports

✓ **سال انتشار:**

2016

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

On-line SERS detection of single bacterium Using Novel SERS Nanoprobes and a microfl uidic Dielectrophoresis device

✓ **نویسندگان:**

Lin H.-Y., Huang C.-H., Hsieh W.-H., Liu L.-H., Lin Y.-C., Chu C.-C., Wang S.-T., Kuo I.-T., Chau L.-K., Yang C.-Y.

✓ **خلاصه پژوهش:**

The integration of novel surface-enhanced Raman scattering (SERS) nanoprobes and a microfl uidic dielectrophoresis (DEP) device is developed for rapid on-line SERS detection of Salmonella enterica serotype Choleraesuis and Neisseria lactamica . The SERS nanoprobes are prepared by immobilization of specifi c antibody onto the surface of nanoaggregate-embedded beads (NAEBs), which are silica-coated, dye-induced aggregates of a small number of gold nanoparticles (AuNPs). Each NAEB gives highly enhanced Raman signals owing to the presence of well-defi ned plasmonic hot spots at junctions between AuNPs. Herein, the on-line SERS detection and accurate identifi cation of suspended bacteria with a detection capability down to a single bacterium has been realized by the NAEB?DEP?Raman spectroscopy biosensing strategy. The practical detection limit with a measurement time of 10 min is estimated to be 70 CFU mL ?1 . In comparison with whole-cell enzyme-linked immunosorbent assay (ELISA), the SERS-nanoprobe-based biosensing method provides advantages of higher sensitivity and requiring lower amount of antibody in the assay (100-fold less). The total assay time including sample pretreatment is less than 2 h. Hence, this sensing strategy is promising for faster and effective on-line multiplex detection of single pathogenic bacterium by using different bioconjugated SERS nanoprobes. © 2014 Wiley-VCH Verlag GmbH &Co. KGaA, Weinheim.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/smll.201401526

✓ **نام ژورنال:**

Small

✓ **سال انتشار:**

2014

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Silver-bacterial cellulosic sponges as active SERS substrates

✓ **نویسندگان:**

Marques P.A.A.P., Nogueira H.I.S., Pinto R.J.B., Neto C.P., Trindade T.

✓ **خلاصه پژوهش:**

Synthetic Ag-bacterial cellulose nanocomposites are reported here and their performance as surface enhanced Raman scattering (SERS) substrates was investigated using thiosalicylic acid and 2,2′-dithiodipyridine as analytes. These nanocomposite materials act as natural sponges when immersed in aqueous or ethanolic solutions allowing capture and SERS detection of certain dissolved molecules. The detection limits for the above organic analytes reached concentrations as low as 10-4 mol·dm-3 and are considerably lower than the conventional vegetable cellulose analogs. Furthermore, we anticipate that the use of these nanocomposites has a beneficial consequence for the development of handy and active cellulosic SERS substrates, in particular for bioanalysis, as we experimentally demonstrated by testing the amino acids L-phenylalanine, L-glutamin and L-histidine. Copyright © 2008 John Wiley & Sons, Ltd.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/jrs.1853

✓ **نام ژورنال:**

Journal of Raman Spectroscopy

✓ **سال انتشار:**

2008

✓ **کلیدواژه‌ها:**

Bacterial cellulose; Nanocomposites; SERS; Silver nanoparticles

✓ **عنوان پژوهش:**

Intuitive Label-Free SERS Detection of Bacteria Using Aptamer-Based in Situ Silver Nanoparticles Synthesis

✓ **نویسندگان:**

Gao W., Li B., Yao R., Li Z., Wang X., Dong X., Qu H., Li Q., Li N., Chi H., Zhou B., Xia Z.

✓ **خلاصه پژوهش:**

The characteristic of an ideal bacteria-detection method should have high sensitivity and specificity, be easy to operate, and not have a time-consuming culture process. In this study, we report a new bacteria-detection strategy that can recognize bacteria quickly and directly by surface-enhanced Raman scattering (SERS) with the formation of well-defined bacteria-aptamer@AgNPs. SERS signals generated by bacteria-aptamer@AgNPs exhibited a linear dependence on bacteria (R2 = 0.9671) concentration ranging from 101 to 107 cfu/mL. The detection limit is sensitive down to 1.5 cfu/mL. Meanwhile, the bacteria SERS signal was dramatically enhanced by its specifically recognized aptamer, and the bacteria could be identified directly and visually through the SERS spectrum. This strategy eliminates the puzzling data analysis of previous studies and offers significant advantages over existing approaches, getting a critical step toward the creation of SERS-based biochips for rapid in situ bacteria detection in mixture samples. © 2017 American Chemical Society.

✓ **لینک** DOI **(استفاده برای دانلود مقاله)**

10.1021/acs.analchem.7b01813

✓ **نام ژورنال:**

Analytical Chemistry

✓ **سال انتشار:**

2017

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ عنوان پژوهش:

The phosphoproteome of the minimal bacterium Mycoplasma pneumoniae: Analysis of the complete known SER/THR kinome suggests the existence of novel kinases

✓ نویسندگان:

Schmidl S.R., Gronau K., Pietack N., Hecker M., Becher D., Stülke J.

✓ خلاصه پژوهش:

Mycoplasma pneumoniae belongs to the Mollicutes, the group of organisms with the smallest genomes that are capable of host-independent life. These bacteria show little regulation in gene expression, suggesting an important role for the control of protein activities. We have studied protein phosphorylation in M. pneumoniae to identify phosphorylated proteins. Two-dimensional gel electrophoresis and mass spectrometry allowed the detection of 63 phosphorylated proteins, many of them enzymes of central carbon metabolism and proteins related to host cell adhesion. We identified 16 phosphorylation sites, among them 8 serine and 8 threonine residues, respectively. A phosphoproteome analysis with mutants affected in the two annotated protein kinase genes or in the single known protein phosphatase gene suggested that only one protein (HPr) is phosphorylated by the HPr kinase, HPrK, whereas four adhesion-related or surface proteins were targets of the protein kinase C, PrkC. A comparison with the phosphoproteomes of other bacteria revealed that protein phosphorylation is evolutionarily only poorly conserved. Only one single protein with an identified phosphorylation site, a phosphosugar mutase (ManB in M. pneumoniae), is phosphorylated on a conserved serine residue in all studied organisms from archaea and bacteria to man. We demonstrate that this protein undergoes autophosphorylation. This explains the strong conservation of this phosphorylation event. For most other proteins, even if they are phosphorylated in different species, the actual phosphorylation sites are different. This suggests that protein phosphorylation is a form of adaptation of the bacteria to the specific needs of their particular ecological niche. © 2010 by The American Society for Biochemistry and Molecular Biology, Inc.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1074/mcp.M900267-MCP200

✓ نام ژورنال:

Molecular and Cellular Proteomics

✓ سال انتشار:

2010

✓ کلیدواژه‌ها:

Detect Precisely

✓ **عنوان پژوهش:**

Detection and differentiation of foodborne pathogenic bacteria in mung bean sprouts using field deployable label-free SERS devices

✓ **نویسندگان:**

Wu X., Xu C., Tripp R.A., Huang Y.-W., Zhao Y.

✓ **خلاصه پژوهش:**

Vancomycin functionalized silver nanorod arrays substrates were used to obtain the surface enhanced Raman scattering (SERS) signals of six foodborne pathogenic bacteria in mung bean sprouts samples using both a portable and a handheld Raman system. The silver nanorod arrays substrates were optimized to facilitate quantitative, rapid, and sensitive detection of Salmonella enterica serotype Anatum, Salmonella enterica serotype Cubana, Salmonella enterica serotype Stanley, Salmonella enteritidis, Escherichia coli O157:H7, and Staphylococcus epidermidis. Substrate optimization was achieved by varying the nanorod length and vancomycin incubation concentration. By combining these substrates with a two-step filtration process we found that the foodborne pathogenic bacteria used in this study can be identified in mung bean sprouts with a limit of detection as low as 100 CFU ml-1 in less than 4 h using both portable and handheld Raman systems. The results show that SERS spectra can be used to differentiate between bacterial species and serotypes when chemometric methods are employed. The low detection limit and rapid detection time of this biosensing platform for foodborne pathogenic bacteria could be a valuable field detection method for the fresh produce and food processing industries. © 2012 The Royal Society of Chemistry.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/c3an00186e

✓ **نام ژورنال:**

Analyst

✓ **سال انتشار:**

2013

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Surface-enhanced Raman spectroscopic detection of a bacteria biomarker using gold nanoparticle immobilized substrates

✓ نویسندگان:

Cheng H.-W., Huan S.-Y., Wu H.-L., Shen G.-L., Yu R.-Q.

✓ خلاصه پژوهش:

The development of ultrasensitive and rapid methods for the detection of dipicolinic acid (DPA), a biomarker for bacterial spores including Bacillus anthracis, is increasingly important. This paper reports the results of an investigation of surface enhanced Raman spectroscopy (SERS) based ultrasensitive detection of DPA using a gold nanoparticle/polyvinylpyrrolidone/gold substrate (AuNPs/PVP/Au). The strong SERS effect of this substrate exploits the particle - particle and particle - substrate plasmonic coupling, which is optimized by manipulating the diameter of the nanoparticles (50-70 nm). The correlation between the SERS intensity of the diagnostic band and the DPA concentration (0.1 ppb to 100 ppm) was shown to exhibit two linear regions, i.e., the low- (<0.01 ppm) and high-concentration (>1 ppm) regions, with an intermediate region in between. The presence of a linear relationship in the low-concentration region was observed for the first time in SERS detection of DPA. A detection limit of 0.1 ppb was obtained from the substrates with 60 nm sized Au NPs, which is, to our knowledge, the lowest detection limit reported for DPA using this type of SERS substrate. This finding was also supported by the estimated enhancement factor (~106) and a large adsorption equilibrium constant for the low-concentration region (1.7 × 10 7 M-1). The adsorption characteristics of DPA on the SERS substrates were analyzed in terms of monolayer and multilayer adsorption isotherms to gain insights into the correlation between the SERS intensity and the DPA concentration. The observed transition from the low- to high-concentration linear regions was found to correspond to the transition from a monolayer to multilayer adsorption isotherm, which was in agreement with the estimated minimum DPA concentration for a monolayer coverage (~0.01 ppm). © 2009 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/ac9014275

✓ نام ژورنال:

Analytical Chemistry

✓ سال انتشار:

2009

✓ کلیدواژه‌ها:

✓ عنوان پژوهش:

Dual-recognition surface-enhanced Raman scattering(SERS)biosensor for pathogenic bacteria detection by using vancomycin-SERS tags and aptamer-Fe3O4@Au

✓ نویسندگان:

Pang Y., Wan N., Shi L., Wang C., Sun Z., Xiao R., Wang S.

✓ خلاصه پژوهش:

Rapid and reliable detection of pathogenic bacteria is vital to prevent and control bacterial diseases. In this study, we present a magnetically assisted surface-enhanced Raman scattering (SERS) biosensor based on the dual-recognition of bacterial cell by aptamer and antibiotic molecules. Aptamer-Fe3O4@Au magnetic nanoparticles (AuMNPs) were synthesized as magnetic and SERS activated substrate for specific bacteria enrichment, vancomycin-SERS tags (Au@MBA) were prepared for the sensitive quantification of pathogenic bacteria. Due to the Au-shell based dual-SERS enhancement and aptamer/vancomycin based dual-recognition ability, a detection limit of 3 cells/mL with a wide dynamic linear range from 10 to 107 cells/mL can be achieved within 50 min without other non-target bacteria interference. When applied in real samples, the approach shows recoveries from 95.0% to 106.4% with relative standard derivation (RSD) less than 5.3%. The SERS strategy could be used to detect a broad range of bacteria by using different aptamers, moreover, the simple operation and precise quantification ability empower this assay great potential in the application of food safety and infectious disease point-of-care diagnosis. © 2019 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.aca.2019.05.059

✓ نام ژورنال:

Analytica Chimica Acta

✓ سال انتشار:

2019

✓ کلیدواژه‌ها:

Aptamer; Bacteria detection; Dual-recognition; Surface-enhanced Raman scattering; Vancomycin-SERS tag

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Review on SERS of bacteria

✓ **نویسندگان:**

Mosier-Boss P.A.

✓ **خلاصه پژوهش:**

Surface enhanced Raman spectroscopy (SERS) has been widely used for chemical detection. Moreover, the inherent richness of the spectral data has made SERS attractive for use in detecting biological materials, including bacteria. This review discusses methods that have been used to obtain SERS spectra of bacteria. The kinds of SERS substrates employed to obtain SERS spectra are discussed as well as how bacteria interact with silver and gold nanoparticles. The roll of capping agents on Ag/Au NPs in obtaining SERS spectra is examined as well as the interpretation of the spectral data. © 2017 by the authors.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.3390/bios7040051

✓ **نام ژورنال:**

Biosensors

✓ **سال انتشار:**

2017

✓ **کلیدواژه‌ها:**

Bacteria; Cell envelope; Nanoparticles; Principal component analysis (PCA); Secretions; Surface-enhanced Raman spectroscopy (SERS)

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

A dielectrophoretic chip with a roughened metal surface for on-chip surface-enhanced Raman scattering analysis of bacteria

✓ **نویسندگان:**

Cheng I.-F., Lin C.-C., Lin D.-Y., Chang H.-C.

✓ **خلاصه پژوهش:**

We present an analysis of the results of in situ surface-enhanced Raman scattering (SERS) of bacteria using a microfluidic chip capable of continuously sorting and concentrating bacteria via three-dimensional dielectrophoresis (DEP). Microchannels were made by sandwiching DEP microelectrodes between two glass slides. Avoiding the use of a metal nanoparticle suspension, a roughened metal surface is integrated into the DEP-based microfluidic chip for on-chip SERS detection of bacteria. On the upper surface of the slide, a roughened metal shelter was settled in front of the DEP concentrator to enhance Raman scattering. Similarly, an electrodepatterned bottom layer fabricated on a thin cover-slip was used to reduce fluorescence noise from the glass substrate. Gram positive (Staphylococcus aureus) and Gram negative (Pseudomonas aeruginosa) bacteria were effectively distinguished in the SERS spectral data. Staphylococcus aureus (concentration of 106 CFU/ml) was continuously separated and concentrated via DEP out of a sample of blood cells. At a flow rate of 1 μl /min, the bacteria were highly concentrated at the roughened surface and ready for on-chip SERS analysis within 3 min. The SERS data were successfully amplified by one order of magnitude and analyzed within a few minutes, resulting in the detection of signature peaks of the respective bacteria. © 2010 American Institute of Physics.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1063/1.3474638

✓ **نام ژورنال:**

Biomicrofluidics

✓ **سال انتشار:**

2010

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ عنوان پژوهش:

A Graphene-Silver Nanoparticle-Silicon Sandwich SERS Chip for Quantitative Detection of Molecules and Capture, Discrimination, and Inactivation of Bacteria

✓ نویسندگان:

Meng X., Wang H., Chen N., Ding P., Shi H., Zhai X., Su Y., He Y.

✓ خلاصه پژوهش:

There currently exists increasing concerns on the development of a kind of high-performance SERS platform, which is suitable for sensing applications ranging from the molecular to cellular (e.g., bacteria) level. Herein, we develop a novel kind of universal SERS chip, made of graphene (G)-silver nanoparticle (AgNP)-silicon (Si) sandwich nanohybrids (G@AgNPs@Si), in which AgNPs are in situ grown on a silicon wafer through hydrofluoric acid-etching-assisted chemical reduction, followed by coating with single-layer graphene via a polymer-protective etching method. The resultant chip features a strong, stable, reproducible surface-enhanced Raman scattering (SERS) effect and reliable quantitative capability. By virtues of these merits, the G@AgNPs@Si platform is capable for not only molecular detection and quantification but also cellular analysis in real systems. As a proof-of-concept application, the chip allows ultrahigh sensitive and reliable detection of adenosine triphosphate (ATP), with a detection limit of ~1 pM. In addition, the chip, serving as a novel multifunctional platform, enables simultaneous capture, discrimination, and inactivation of bacteria. Typically, the bacterial capture efficiency is 54% at 108 CFU mL-1 bacteria, and the antibacterial rate reaches 93% after 24 h of treatment. Of particular note, Escherichia coli and Staphylococcus aureus spiked into blood can be readily distinguished via the chip, suggesting its high potential for clinical applications. © 2018 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acs.analchem.7b05139

✓ نام ژورنال:

Analytical Chemistry

✓ سال انتشار:

2018

✓ کلیدواژه‌ها:

02122402199 www.teksan.co Telegram: @teksan Instagram: Teksan.ir
02122407580 info@teksan.ir Whatsapp: 09021835726 Linkedin: Teksan-co

✓ **عنوان پژوهش:**

Near-Infrared Surface-Enhanced-Raman-Scattering-Mediated Detection of Single Optically Trapped Bacterial Spores

✓ **نویسندگان:**

Alexander T.A., Pellegrino P.M., Gillespie J.B.

✓ **خلاصه پژوهش:**

A novel methodology has been developed for the investigation of bacterial spores. Specifically, this method has been used to probe the spore coat composition of two different Bacillus stearothermophilus variants. This technique may be useful In many applications; most notably, development of novel detection schemes toward potentially harmful bacteria. This method would also be useful as an ancillary environmental monitoring system where sterility is of importance (i.e., food preparation areas as well as invasive and minimally invasive medical applications). This unique detection scheme is based on the near-infrared (NIR) surface-enhanced Raman scattering (SERS) from single, optically trapped, bacterial spores. The SERS spectra of bacterial spores In aqueous media have been measured using SERS substrates based on ~60-nm-diameter gold colloids bound to 3-aminopropyltriethoxysilane derivatized glass. The light from a 787-nm laser diode was used to trap and manipulate as well as simultaneously excite the SERS of an individual bacterial spore. The collected SERS spectra were examined for uniqueness and the applicability of this technique for the strain discrimination of Bacillus stearothermophilus spores. Comparison of normal Raman and SERS spectra reveals not only an enhancement of the normal Raman spectral features but also the appearance of spectral features absent in the normal Raman spectrum.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1366/000370203322554482

✓ **نام ژورنال:**

Applied Spectroscopy

✓ **سال انتشار:**

2003

✓ **کلیدواژه‌ها:**

Bacterial spore; Optical tweezer; Surface-enhanced Raman scattering

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Bacterial Phosphoenolpyruvate-Dependent Phosphotransferase System: P-Ser-HPr and Its Possible Regulatory Function

✓ نویسندگان:

Deutscher J., Kessler U., Alpert C.A., Hengstenberg W.

✓ خلاصه پژوهش:

HPr of the bacterial phosphotransferase system is a histidine-containing phospho-carrier protein. It is phosphorylated at a single histidyl residue with phosphoenolpyruvate (PEP) and enzyme I and transfers the mstidyl-bound phosphoryl group to a variety of factor III proteins. Recently, we described an HPr phosphorylated at a seryl residue (P-Ser-HPr), which is formed in an adenosine 5′-triphosphate dependent reaction catalyzed by a protein kinase [Deutscher, J., & Saier, M.-H., Jr. (1983) Proc. Natl. Acad. Sci. U.S.A. 80, 6790-6794]. Now we demonstrate that this P-Ser-HPr is an altered substrate of phosphorylated enzyme I and factor III proteins compared to unphosphorylated HPr. Thus, P-Ser-HPr of Streptococcus lactis is phosphorylated about 5000 times slower by PEP and enzyme I than HPr. The slow phosphorylation by PEP and enzyme I can be overeóme when factor III protein specific for gluconate (factor IIIGct) of Streptococcus faecalis is added. Most likely, a complex of P-Ser-HPr and factor in'3'4 is formed which then becomes phosphorylated as fast as free HPr. Factor III protein specific for lactose (factor III1 III-40) of Staphylococcus aureus also enhances the phosphorylation of P-Ser-HPr by enzyme I and PEP, but its effect is lower. Thus, P-Ser-HPr is phosphorylated 70-100-fold slower in the presence of factor IIILao than in the presence of factor III004. The described interaction of P-Ser-HPr with enzyme I in the presence of different factor III proteins could account for the regulation of sugar uptake within the phosphotransferase system. Some of the phosphoenolpyruvate-dependent phosphotransferase system sugars like glucose are known to be taken up in preference to others, for example, lactose. © 1984, American Chemical Society. All rights reserved.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/bi00314a033

✓ نام ژورنال:

Biochemistry

✓ سال انتشار:

1984

✓ کلیدواژه‌ها:

✓ **عنوان پژوهش:**

Sensitive and specific detection of clinical bacteria: Via vancomycin-modified Fe3O4@Au nanoparticles and aptamer-functionalized SERS tags

✓ **نویسندگان:**

Zhang C., Wang C., Xiao R., Tang L., Huang J., Wu D., Liu S., Wang Y., Zhang D., Wang S., Chen X.

✓ **خلاصه پژوهش:**

A sensitive surface-enhanced Raman scattering (SERS) platform for the simultaneous detection of two pathogenic bacteria on the basis of dual recognition by vancomycin and aptamers is reported for the first time, using Escherichia coli (E. coli) and Staphylococcus aureus (S. aureus) as target bacteria. This dual-recognition platform was developed using vancomycin-modified Fe3O4@Au magnetic nanoparticles (Fe3O4@Au-Van MNPs) for broad-spectrum recognition and efficient bacterial enrichment, and aptamer-functionalized SERS tags for the specific and sensitive quantification of target bacteria in authentic specimens. Our results showed that the Fe3O4@Au-Van MNPs allow the rapid capture of bacteria from complex solutions with a capture efficiency as high as 88.89% for S. aureus and 74.96% for E. coli within 15 min. The limits of detection (LODs) of the platform were found to be 20 and 50 cells mL-1 for S. aureus and E. coli, respectively, and favorable linear relations were observed between the logarithm of bacterial concentration and the SERS intensity at the characteristic Raman peaks. The high specificity and potential clinical applications of the technique were also proven. Our method elucidated novel advances and potential applications in the field of multiple SERS detection of pathogens. © 2018 The Royal Society of Chemistry.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/c8tb00504d

✓ **نام ژورنال:**

Journal of Materials Chemistry B

✓ **سال انتشار:**

2018

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Surface-enhanced Raman spectroscopy of bacteria: The effect of excitation wavelength and chemical modification of the colloidal milieu

✓ **نویسندگان:**

Zeiri L., Efrima S.

✓ **خلاصه پژوهش:**

Surface-enhanced Raman spectroscopy (SERS) of bacteria infused with silver or gold colloids reflects the different biochemicals in the immediate, nano-vicinity of the particles. In particular we demonstrate high sensitivity to flavins, important coenzymes usually associated with the cell wall. Varying the type of colloid, the laser excitation wavelength and the chemical protocols enables us to observe spectral signatures from different biochemical components of the microorganism. Specifically, we can switch between normal Raman, resonance Raman, and SERS, altering the relative spectral contributions of the various cell constituents. Copyright © 2005 John Wiley & Sons, Ltd.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/jrs.1349

✓ **نام ژورنال:**

Journal of Raman Spectroscopy

✓ **سال انتشار:**

2005

✓ **کلیدواژه‌ها:**

Bacteria; Gold colloids; Resonance Raman spectra; Silver colloids; Surface-enhanced Raman scattering

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Rapid detection of bacteria from blood with surface-enhanced Raman spectroscopy

✓ **نویسندگان:**

Boardman A.K., Wong W.S., Premasiri W.R., Ziegler L.D., Lee J.C., Miljkovic M., Klapperich C.M., Sharon A., Sauer-Budge A.F.

✓ **خلاصه پژوهش:**

Traditional methods for identifying pathogens in bacteremic patients are slow (24-48+ h). This can lead to physicians making treatment decisions based on an incomplete diagnosis and potentially increasing the patient's mortality risk. To decrease time to diagnosis, we have developed a novel technology that can recover viable bacteria directly from whole blood and identify them in less than 7 h. Our technology combines a sample preparation process with surface-enhanced Raman spectroscopy (SERS). The sample preparation process enriches viable microorganisms from 10 mL of whole blood into a 200 μL aliquot. After a short incubation period, SERS is used to identify the microorganisms. We further demonstrated that SERS can be used as a broad detection method, as it identified a model set of 17 clinical blood culture isolates and microbial reference strains with 100% identification agreement. By applying the integrated technology of sample preparation and SERS to spiked whole blood samples, we were able to correctly identify both Staphylococcus aureus and Escherichia coli 97% of the time with 97% specificity and 88% sensitivity. © 2016 American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acs.analchem.6b01273

✓ **نام ژورنال:**

Analytical Chemistry

✓ **سال انتشار:**

2016

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Integration of a nanostructured dielectrophoretic device and a surface-enhanced Raman probe for highly sensitive rapid bacteria detection

✓ نویسندگان:

Madiyar F.R., Bhana S., Swisher L.Z., Culbertson C.T., Huang X., Li J.

✓ خلاصه پژوهش:

This work reports a synergistic approach to the concentration, detection and kinetic monitoring of pathogens through the integration of nanostructured dielectrophoresis (DEP) with nanotag-labelled Surface Enhanced Raman Spectroscopy (SERS). A nanoelectrode array made of embedded Vertically Aligned Carbon Nanofibers (VACNFs) at the bottom of a microfluidic chip was used to effectively capture and concentrate nanotag-labelled E. coli DHα5 cells into a 200 μm × 200 μm area on which a Raman laser probe was focused. The SERS nanotags were based on iron oxide-gold (IO-Au) core-shell nanoovals (NOVs) of ~50 nm size, which were coated with a QSY21 Raman reporter and attached to E. coli through specific immunochemistry. The combination of the greatly enhanced Raman signal by the SERS nanotags and the effective DEP concentration significantly improved the detection limit and speed. The SERS signal was measured with both a confocal Raman microscope and a portable Raman probe during DEP capture, and was fully validated with fluorescence microscopy measurements under all DEP conditions. The SERS measurements were sensitive enough to detect a single bacterium. A concentration detection limit as low as 210 cfu ml-1 using a portable Raman system was obtained with a DEP capture time of only ~50 s. These results demonstrate the potential to develop a compact portable system for rapid and highly sensitive detection of specific pathogens. This system is reusable, requires minimum sample preparation, and is amenable to field applications. This journal is © The Royal Society of Chemistry.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1039/c4nr07183b

✓ نام ژورنال:

Nanoscale

✓ سال انتشار:

2015

✓ کلیدواژه‌ها:

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

On sample preparation for surface-enhanced Raman scattering (SERS) of bacteria and the source of spectral features of the spectra

✓ **نویسندگان:**

Kahraman M., Keseroğlu K., Çulha M.

✓ **خلاصه پژوهش:**

The characterization, detection, and identification of bacteria using surface-enhanced Raman scattering (SERS) spectroscopy is drawing considerable attention due to its ability to provide rich intrinsic molecular information about molecules and molecular structures in close proximity to noble metal surfaces. However, sample preparation methods and experimental conditions must be carefully evaluated in order to obtain healthy, interpretable, and comparable results. In this study, several bacterial species including E. coli, B. megaterium, S. aureus, and S. cohnii were systematically evaluated to demonstrate the source of the spectral features of bacterial SERS spectra. It was found that the features observed in bacterial SERS spectra originate mostly from the bacteria surface with some contributions from metabolic activity or molecular species detached from the bacteria surface during sample preparation. © 2011 Society for Applied Spectroscopy.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1366/10-06184

✓ **نام ژورنال:**

Applied Spectroscopy

✓ **سال انتشار:**

2011

✓ **کلیدواژه‌ها:**

Bacteria identification; Experimental conditions; Sample preparation; SERS; Spectral origins; Surface-enhanced raman scattering spectroscopy

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Fabrication of Ag/ZnO/reduced graphene oxide nanocomposite for SERS detection and multiway killing of bacteria

✓ **نویسندگان:**

Ko Y.C., Fang H.Y., Chen D.H.

✓ **خلاصه پژوهش:**

Ag/ZnO/reduced graphene oxide (Ag/ZnO/rGO) nanocomposite was developed for the detection and multiway killing of bacteria. It combined the photocatalytic property of ZnO nanoparticles, the high specific surface area and near infrared (NIR) photothermal conversion property of rGO, as well as the bacteria-killing capability and surface enhanced Raman scattering (SERS) property of Ag nanoparticles. Firstly, ZnO/rGO nanocomposite was prepared by solvothermal method with zinc acetate and graphene oxide (GO) as the precursors. The influences of GO content on the growth of ZnO nanoparticles onto the surface of rGO and the photocatalytic property were examined to obtain a ZnO/rGO nanocomposite with better photocatalytic activity. Secondly, Ag nanoparticles were further deposited on the surface of ZnO/rGO nanocomposite by the microwave-assisted arginine reduction method. It was demonstrated that the resulting Ag/ZnO/rGO nanocomposite could be used for both the SERS detection and efficient killing of E. coli. Furthermore, it was shown that the bacteria-killing performance of nano-Ag could be effectively enhanced by combining the photocatalytic or photothermal mechanism. © 2016 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.jallcom.2016.10.241

✓ **نام ژورنال:**

Journal of Alloys and Compounds

✓ **سال انتشار:**

2017

✓ **کلیدواژه‌ها:**

Ag/ZnO/rGO nanocomposite; Bacteria-killing; Photocatalytic; Photothermal; SERS detection

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

Label-free NIR-SERS discrimination and detection of foodborne bacteria by in situ synthesis of Ag colloids

✓ **نویسندگان:**

Chen L., Mungroo N., Daikuara L., Neethirajan S.

✓ **خلاصه پژوهش:**

Background: Rapid detection and discrimination of bacteria for biomedical and food safety applications remain a considerable challenge. We report a label-free near infrared surface-enhanced Raman scattering (NIR-SERS) method for the discrimination of pathogenic bacteria from drinking water. The approach relies on the in situ synthesis of silver nanoparticles (Ag NPs) within the bacterial cell suspensions. Results: Pre-treatment of cells with Triton X-100 significantly improved the sensitivity of the assay. Using this method, we were able to discriminate several common pathogenic bacteria such as Escherichia coli, Pseudomonas aeruginosa, Methicillin-resistant Staphylococcus aureus (MRSA) and Listeria spp. A comparison of the SERS spectra allowed for the discrimination of two Listeria species, namely L. monocytogenes and L. innocua. We further report the application of the method to discriminate two MRSA strains from clinical isolates. The complete assay was completed in a span of 5 min. Conclusions: The proposed analytical method proves to be a rapid tool for selective and label-free identification of pathogenic bacterium. Pre-treatment of bacterial cells with Triton X-100 resulted in new features on the SERS spectra, allowing for a successful discrimination of common disease related bacteria including E. coli, P. aeruginosa, Listeria and MRSA. We also demonstrate that the spectral features obtained using in situ synthesis of nanoparticles could be could be used to differentiate two species of listeria. By using L.innocua as a model sample, we found the limit of detection of our assay to be 103 CFU/mL. The method can selectively discriminate different bacterial species, and has a potential to be used in the development of point-of-care diagnostics with biomedical and food safety applications. © 2015 Chen et al.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1186/s12951-015-0106-4

✓ **نام ژورنال:**

Journal of Nanobiotechnology

✓ **سال انتشار:**

2015

✓ **کلیدواژه‌ها:**

Bacteria; Discrimination; In situ synthesis; Silver nanoparticles; Surface-enhanced Raman scattering

✓ **عنوان پژوهش:**

Surface-Enhanced Raman Scattering for Rapid Detection and Characterization of Antibiotic-Resistant Bacteria

✓ **نویسندگان:**

Galvan D.D., Yu Q.

✓ **خلاصه پژوهش:**

As the prevalence of antibiotic-resistant bacteria continues to rise, biosensing technologies are needed to enable rapid diagnosis of bacterial infections. Furthermore, understanding the unique biochemistry of resistance mechanisms can facilitate the development of next generation therapeutics. Surface-enhanced Raman scattering (SERS) offers a potential solution to real-time diagnostic technologies, as well as a route to fundamental, mechanistic studies. In the current review, SERS-based approaches to the detection and characterization of antibiotic-resistant bacteria are covered. The commonly used nanomaterials (nanoparticles and nanostructured surfaces) and surface modifications (antibodies, aptamers, reporters, etc.) for SERS bacterial detection and differentiation are discussed first, and followed by a review of SERS-based detection of antibiotic-resistant bacteria from environmental/food processing and clinical sources. Antibiotic susceptibility testing and minimum inhibitory concentration testing with SERS are then summarized. Finally, recent developments of SERS-based chemical imaging/mapping of bacteria are reviewed. © 2018 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1002/adhm.201701335

✓ **نام ژورنال:**

Advanced Healthcare Materials

✓ **سال انتشار:**

2018

✓ **کلیدواژه‌ها:**

antibiotic susceptibility testing; antibiotic-resistant bacteria; chemical imaging/mapping; multifunctional nanoparticles/structures; surface-enhanced Raman scattering

✓ **عنوان پژوهش:**

Characterization of thermophilic bacteria using surface-enhanced Raman scattering

✓ **نویسندگان:**

Çulha M., Adigüzel A., Yazici M.M., Kahraman M., Şahin F., Güllüce M.

✓ **خلاصه پژوهش:**

Surface-enhanced Raman scattering (SERS) can provide molecular-level information about the molecules and molecular structures in the vicinity of nanostructured noble metal surfaces such as gold and silver. The three thermophilic bacteria Bacillus licheniformis, Geobacillus stearothermophilus, and Geobacillus pallidus, a Gram-negative bacterium E. coli, and a Gram-positive bacterium B. megaterium are comparatively characterized using SERS. The SERS spectra of thermophilic bacteria are similar, while they show significant differences compared to E. coli and B. megaterium. The findings indicate that a higher number of thiol residues and possible S-S bridges are present in the cell wall structure of thermophilic bacteria, providing their stability at elevated temperatures. Incubating the thermophilic bacteria with colloidal silver suspension at longer times improved the bacteria-silver nanoparticle interaction kinetics, while increased temperature does not have a pronounced effect on spectral features. A tentative assignment of the SERS bands was attempted for thermophilic bacteria. The results indicate that SERS can be a useful tool to study bacterial cell wall molecular differences.
© 2008 Society for Applied Spectroscopy.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1366/000370208786401545

✓ **نام ژورنال:**

Applied Spectroscopy

✓ **سال انتشار:**

2008

✓ **کلیدواژه‌ها:**

Bacteria; Cell walls; SERS; Silver nanoparticles; Surface-enhanced raman spectroscopy; Thermophilic bacteria

✓ **عنوان پژوهش:**

NetPhosBac - A predictor for Ser/Thr phosphorylation sites in bacterial proteins

✓ **نویسندگان:**

Miller M.L., Soufi B., Jers C., Blom N., Macek B., Mijakovic I.

✓ **خلاصه پژوهش:**

There is ample evidence for the involvement of protein phosphorylation on serine/threonine/tyrosine in bacterial signaling and regulation, but very few exact phosphorylation sites have been experimentally determined. Recently, gel-free high accuracy MS studies reported over 150 phosphorylation sites in two bacterial model organisms Bacillus subtilis and Escherichia coli. Interestingly, the analysis of these phosphorylation sites revealed that most of them are not characteristic for eukaryotic-type protein kinases, which explains the poor performance of eukaryotic data-trained phosphorylation predictors on bacterial systems. We used these large bacterial datasets and neural network algorithms to create the first bacteria-specific protein phosphorylation predictor: NetPhosBac. With respect to predicting bacterial phosphorylation sites, NetPhosBac significantly outperformed all benchmark predictors. Moreover, NetPhosBac predictions of phosphorylation sites in E. coli proteins were experimentally verified on protein and site-specific levels. In conclusion, NetPhosBac clearly illustrates the advantage oftaxa-specific predictors and we hope it will provide a useful asset to the microbiological community. © 2009 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/pmic.200800285

✓ **نام ژورنال:**

Proteomics

✓ **سال انتشار:**

2009

✓ **کلیدواژه‌ها:**

Artificial neural network; Bacteria; Kinase; Prediction; Protein phosphorylation

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Label-free mapping of single bacterial cells using surface-enhanced Raman spectroscopy

✓ **نویسندگان:**

Wang P., Pang S., Chen J., McLandsborough L., Nugen S.R., Fan M., He L.

✓ **خلاصه پژوهش:**

Here we presented a simple, rapid and label-free surface-enhanced Raman spectroscopy (SERS) based mapping method for the detection and discrimination of Salmonella enterica and Escherichia coli on silver dendrites. The sample preparation was first optimized to maximize sensitivity. The mapping method was then used to scan through the bacterial cells adsorbed on the surface of silver dendrites. The intrinsic and distinct SERS signals of bacterial cells were used as the basis for label-free detection and discrimination. The results show the developed method is able to detect single bacterial cells adsorbed on the silver dendrites with a limit of detection as low as 104 CFU mL-1, which is two orders of magnitude lower than the traditional SERS method under the same experimental condition. The time needed for collecting a 225 points map was approximately 24 minutes. Moreover, the developed SERS mapping method can realize simultaneous detection and identification of Salmonella enterica subsp. enterica BAA1045 and Escherichia coli BL21 from a mixture sample using principle component analysis. Our results demonstrate the great potential of the label-free SERS mapping method to detect, identify and quantify bacteria and bacterial mixtures simultaneously. © The Royal Society of Chemistry 2016.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/c5an02175h

✓ **نام ژورنال:**

Analyst

✓ **سال انتشار:**

2016

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Differentiation and classification of bacteria using vancomycin functionalized silver nanorods array based surface-enhanced Raman spectroscopy and chemometric analysis

✓ **نویسندگان:**

Wu X., Huang Y.-W., Park B., Tripp R.A., Zhao Y.

✓ **خلاصه پژوهش:**

Twenty seven different bacteria isolates from 12 species were analyzed using intrinsic surface-enhanced Raman scattering (SERS) spectra with recently developed vancomycin coated silver nanorod (VAN AgNR) substrates. The VAN AgNR substrates could generate reproducible SERS spectra of the bacteria with little to no interference from the environment or bacterial by-products as compared to the pristine substrates. By taking advantage of the structural composition of the cellular wall which varies from species to species, the differentiation of bacterial species is demonstrated by using chemometric analyses on those spectra. A second chemometric analysis step within the species cluster is able to differentiate serotypes and strains. The spectral features used for serotype differentiation arises from the surface proteins, while Raman peaks from adenine dominate the differentiation of strains. In addition, due to the intrinsic structural differences in the cell walls, the SERS spectra can distinguish Gram-positive from Gram-negative bacteria with high sensitivity and specificity, as well as 100% accuracy on predicting test samples. Our results provide important insights for using SERS as a bacterial diagnostic tool and further guide the design of a SERS-based detection platform. © 2015 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.talanta.2015.02.045

✓ **نام ژورنال:**

Talanta

✓ **سال انتشار:**

2015

✓ **کلیدواژه‌ها:**

Bacteria detection; Chemometric analysis; Raman scattering; Silver nanorods; Surface enhanced; Vancomycin

✓ **عنوان پژوهش:**

Silica encapsulated SERS nanoprobe conjugated to the bacteriophage tailspike protein for targeted detection of Salmonella

✓ **نویسندگان:**

Tay L.-L., Huang P.-J., Tanha J., Ryan S., Wu X., Hulse J., Chau L.-K.

✓ **خلاصه پژوهش:**

Silica-encapsulated Raman-reporter embedded SERS nanoprobes, named nanoaggregate embedded beads (NAEBs), were conjugated to the Salmonella specific tailspike protein (TSP) isolated from the P22 bacteriophage to enable a highly specific and ultrasensitive optical transduction platform. We demonstrate three successful surface conjugation strategies and highlight the detection of a single bacterium using SERS. © 2012 The Royal Society of Chemistry.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/c1cc16325f

✓ **نام ژورنال:**

Chemical Communications

✓ **سال انتشار:**

2012

✓ **کلیدواژه‌ها:**

TEKSAN
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✓ **عنوان پژوهش:**

On the difference between surface-enhanced Raman scattering (SERS) spectra of cell growth media and whole bacterial cells

✓ **نویسندگان:**

Premasiri W.R., Gebregziabher Y., Ziegler L.D.

✓ **خلاصه پژوهش:**

It has been recently suggested [N. E. Marotta and L. A. Bottomley, Appl. Spectrosc. 64, 601-606 (2010)] that previously reported surface-enhanced Raman scattering (SERS) spectra of vegetative bacterial cells are due to residual cell growth media that were not properly removed from samples of the lab-cultured microorganism suspensions. SERS spectra of several commonly used cell growth media are similar to those of bacterial cells, as shown here and reported elsewhere. However, a multivariate data analysis approach shows that SERS spectra of different bacterial species grown in the same growth media exhibit different characteristic vibrational spectra, SERS spectra of the same organism grown in different media display the same SERS spectrum, and SERS spectra of growth media do not cluster near the SERS spectra of washed bacteria. Furthermore, a bacterial SERS spectrum grown in a minimal medium, which uses inorganics for a nitrogen source and displays virtually no SERS features, exhibits a characteristic bacterial SERS spectrum. We use multivariate analysis to show how successive water washing and centrifugation cycles remove cell growth media and result in a robust bacterial SERS spectrum in contrast to the previous study attributing bacterial SERS signals to growth media. © 2011 Society for Applied Spectroscopy.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1366/10-06173

✓ **نام ژورنال:**

Applied Spectroscopy

✓ **سال انتشار:**

2011

✓ **کلیدواژه‌ها:**

Bacteria identification; Diagnostics; Growth media; PCA; Principle component analysis; SERS; Surface-enhanced raman scattering spectroscopy

✓ **عنوان پژوهش:**

Gold–silver nanoshells promote wound healing from drug-resistant bacteria infection and enable monitoring via surface-enhanced Raman scattering imaging

✓ **نویسندگان:**

He J., Qiao Y., Zhang H., Zhao J., Li W., Xie T., Zhong D., Wei Q., Hua S., Yu Y., Yao K., Santos H.A., Zhou M.

✓ **خلاصه پژوهش:**

Chronic infections, caused by multidrug-resistant (MDR) bacteria, constitute a serious problem yet often underappreciated in clinical practice. The in situ monitoring of the bacteria-infected disease is also necessary to track and verify the therapeutic effect. Herein we present a facile approach to overcome the above challenges through a Raman tag 3,3′-diethylthiatricarbocyanine iodide (DTTC)-conjugated gold-silver nanoshells (AuAgNSs). With a strong responsive of the near-infrared laser due to surface plasmon resonance (SPR) from hybrid metallic nanoshell structure, AuAgNSs exhibits an efficient photothermal effect, and it simultaneously releases silver ions during laser irradiation to bacterial eradicate. Herein, two MDR bacteria strain, methicillin-resistant Staphylococcus aureus (MRSA) and extended-spectrum β-lactamase Escherichia coli, are chosen as models and studied both in vitro and in vivo. As a result, the AuAgNSs-DTTC substrates enable surface-enhanced Raman scattering imaging to provide a non-invasive and extremely high sensitive detection (down to 300 CFU mL−1 for MRSA) and prolonged tracking (at least 8 days) of residual bacteria. In a chronic MRSA-infected wound mouse model, the AuAgNSs gel-mediated photothermal therapy/silver-release leads to a synergistic would healing with negligible toxicity or collateral damage to vital organs. These results suggest that AuAgNSs-DTTC is a promising anti-bacterial tool for clinical translation. © 2020 Elsevier Ltd

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.biomaterials.2020.119763

✓ **نام ژورنال:**

Biomaterials

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

Gold-silver nanoshells; Multidrug-resistant bacteria; Photothermal therapy; SERS; Wound healing

✓ **عنوان پژوهش:**

Bacterial Nanocellulose-Based Flexible Surface Enhanced Raman Scattering Substrate

✓ **نویسندگان:**

Tian L., Jiang Q., Liu K.-K., Luan J., Naik R.R., Singamaneni S.

✓ **خلاصه پژوهش:**

Owing to high purity, simple surface chemistry, and 3D nanofibrous structure, biosynthesized bacterial nanocellulose (BNC) is a highly attractive biomaterial for a wide range of applications. Conventional cellulose-based laboratory filter paper, adsorbed with plasmonic nanostructures can be employed as a flexible surface enhanced Raman scattering (SERS) substrate. In this work, a BNC film-based SERS substrate fabricated by gravity-assisted filtration method is reported. The 3D porous structure of BNC facilitates uniform and dense adsorption of plasmonic nanostructures on the surface and in subsurface regions, which results in large SERS enhancement. Furthermore, significantly lower surface roughness of BNC compared to conventional filter paper results in an excellent uniformity of SERS activity across the entire substrate. Harnessing the smooth surface of BNC, it is shown that BNC-based SERS substrate serves as an ideal platform for collection, detection, and recognition of bacteria. The 3D plasmonic BNC composites demonstrated here are highly attractive for a broad range of applications including sensing, catalysis, and energy harvesting. © 2016 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/admi.201600214

✓ **نام ژورنال:**

Advanced Materials Interfaces

✓ **سال انتشار:**

2016

✓ **کلیدواژه‌ها:**

bacterial nanocellulose; flexible SERS substrates; gold nanorods; surface enhanced Raman scattering; swab

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

The origin of the band at around 730 cm-1 in the SERS spectra of bacteria: A stable isotope approach

✓ **نویسندگان:**

Kubryk P., Niessner R., Ivleva N.P.

✓ **خلاصه پژوهش:**

Raman microspectroscopy is an emerging tool to analyze the molecular and isotopic composition of single microbial cells. It can be used to achieve an in situ understanding of metabolic processes. Due to the low sensitivity of the Raman effect, surface-enhanced Raman scattering (SERS) is utilized to enhance the Raman signal. The SERS spectra of bacteria are usually characterized by a pronounced band at around 730 cm-1, which is assigned to glycosidic ring vibrations or to adenine or even to CH2 deformation in different studies. In order to clarify the origin of this band, we employed a stable isotope approach and performed a SERS analysis of Escherichia coli bacteria using in situ prepared Ag nanoparticles. The cells were grown on unlabeled (12C, 14N) and labeled (13C, 15N) carbon and nitrogen sources in different combinations. The SERS band of the stable isotope labeled microorganisms showed a characteristic red-shift in the SERS spectra, which solely depends on the isotopic composition. It was therefore possible to confidently assign this band to adenine-related compounds. Furthermore, by utilizing the fingerprint area of single-cell SERS spectra as the input for the principal component analysis, one can clearly differentiate between E. coli bacteria incorporating different stable isotopes. © 2016 The Royal Society of Chemistry.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/c6an00306k

✓ **نام ژورنال:**

Analyst

✓ **سال انتشار:**

2016

✓ **کلیدواژه‌ها:**

✓ عنوان پژوهش:

M13 Bacteriophage/Silver Nanowire Surface-Enhanced Raman Scattering Sensor for Sensitive and Selective Pesticide Detection

✓ نویسندگان:

Koh E.H., Mun C., Kim C., Park S.-G., Choi E.J., Kim S.H., Dang J., Choo J., Oh J.-W., Kim D.-H., Jung H.S.

✓ خلاصه پژوهش:

A surface-enhanced Raman scattering (SERS) sensor comprising silver nanowires (AgNWs) and genetically engineered M13 bacteriophages expressing a tryptophan-histidine-tryptophan (WHW) peptide sequence (BPWHW) was fabricated by simple mixing of BPWHW and AgNW solutions, followed by vacuum filtration onto a glass-fiber filter paper (GFFP) membrane. The AgNWs stacked on the GFFP formed a high density of SERS-active hot spots at the points of nanowire intersections, and the surface-coated BPWHW functioned as a bioreceptor for selective pesticide detection. The BPWHW-functionalized AgNW (BPWHW/AgNW) sensor was characterized by scanning electron microscopy, confocal scanning fluorescence microscopy, atomic force microscopy, and Fourier transform infrared spectroscopy. The Raman signal enhancement and the selective pesticide SERS detection properties of the BPWHW/AgNW sensor were investigated in the presence of control substrates such as wild-type M13 bacteriophage-decorated AgNWs (BPWT/AgNW) and undecorated AgNWs (AgNW). The BPWHW/AgNW sensor exhibited a significantly higher capture capability for pesticides, especially paraquat (PQ), than the control SERS substrates, and it also showed a relatively higher selectivity for PQ than for other bipyridylium pesticides such as diquat and difenzoquat. Furthermore, as a field application test, PQ was detected on the surface of PQ-pretreated apple peels, and the results demonstrated the feasibility of using a paper-based SERS substrate for on-site residual pesticide detection. The developed M13 bacteriophage-functionalized AgNW SERS sensor might be applicable for the detection of various pesticides and chemicals through modification of the M13 bacteriophage surface peptide sequence. © 2018 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acsami.8b01470

✓ نام ژورنال:

ACS Applied Materials and Interfaces

✓ سال انتشار:

2018

✓ کلیدواژه‌ها:

chemical sensor; M13 Bacteriophage; pesticide detection; silver nanowires; surface-enhanced Raman scattering

✓ **عنوان پژوهش:**

Discrimination of bacteria and bacteriophages by Raman spectroscopy and surface-enhanced Raman spectroscopy

✓ **نویسندگان:**

Goeller L.J., Riley M.R.

✓ **خلاصه پژوهش:**

Detection of pathogenic organisms in the environment presents several challenges due to the high cost and long times typically required for identification and quantification. Polymerase chain reaction (PCR) based methods are often hindered by the presence of polymerase inhibiting compounds and so direct methods of quantification that do not require enrichment or amplification are being sought. This work presents an analysis of pathogen detection using Raman spectroscopy to identify and quantify microorganisms without drying. Confocal Raman measurements of the bacterium Escherichia coli and of two bacteriophages, MS2 and PRD1, were analyzed for characteristic peaks and to estimate detection limits using traditional Raman and surface-enhanced Raman spectroscopy (SERS). MS2, PRD1, and E. coli produced differentiable Raman spectra with approximate detection limits for PRD1 and E. coli of 10 9 pfu/mL and 10 6 cells/mL, respectively. These high detection concentration limits are partly due to the small sampling volume of the confocal system but translate to quantification of as little as 100 bacteriophages to generate a reliable spectral signal. SERS increased signal intensity 10 3 fold and presented peaks that were visible using 2-second acquisitions; however, peak locations and intensities were variable, as typical with SERS. These results demonstrate that Raman spectroscopy and SERS have potential as a pathogen monitoring platform. © 2007 Society for Applied Spectroscopy.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1366/000370207781393217

✓ **نام ژورنال:**

Applied Spectroscopy

✓ **سال انتشار:**

2007

✓ **کلیدواژه‌ها:**

Bacteriophage; Pathogen detection; Raman spectroscopy; Surface-enhanced Raman spectroscopy

✓ عنوان پژوهش:

Combined use of vancomycin-modified Ag-coated magnetic nanoparticles and secondary enhanced nanoparticles for rapid surface-enhanced Raman scattering detection of bacteria

✓ نویسندگان:

Wang C.W., Gu B., Liu Q.Q., Pang Y.F., Xiao R., Wang S.Q.

✓ خلاصه پژوهش:

Background: Pathogenic bacteria have always been a significant threat to human health. The detection of pathogens needs to be rapid, accurate, and convenient. Methods: We present a sensitive surface-enhanced Raman scattering (SERS) biosensor based on the combination of vancomycin-modified Ag-coated magnetic nanoparticles (Fe3O4@Ag- Van MNPs) and Au@Ag nanoparticles (NPs) that can effectively capture and discriminate bacterial pathogens from solution. The high-performance Fe3O4@Ag MNPs were modified with vancomycin and used as bacteria capturer for magnetic separation and enrichment. The modified MNPS were found to exhibit strong affinity with a broad range of Gram-positive and Gram-negative bacteria. After separating and rinsing bacteria, Fe3O4@Ag-Van MNPs and Au@ Ag NPs were synergistically used to construct a very large number of hot spots on bacteria cells, leading to ultrasensitive SERS detection. Results: The dominant merits of our dual enhanced strategy included high bacterial-capture efficiency (>65%) within a wide pH range (pH 3.0-11.0), a short assay time (<30 min), and a low detection limit (5×102 cells/mL). Moreover, the spiked tests show that this method is still valid in milk and blood samples. Owing to these capabilities, the combined system enabled the sensitive and specific discrimination of different pathogens in complex solution, as verified by its detection of Gram-positive bacterium Escherichia coli, Gram-positive bacterium Staphylococcus aureus, and methicillin-resistant S. aureus. Conclusion: This method has great potential for field applications in food safety, environmental monitoring, and infectious disease diagnosis. © 2018 Wang et al.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.2147/IJN.S150336

✓ نام ژورنال:

International Journal of Nanomedicine

✓ سال انتشار:

2018

✓ کلیدواژه‌ها:

Au@Ag nanoparticles; Fe3O4@Ag magnetic nanoparticle; Rapid bacteria detection; Surface-enhanced Raman scattering; Vancomycin-modified

✓ **عنوان پژوهش:**

A facile method for fabrication of buckled PDMS silver nanorod arrays as active 3D SERS cages for bacterial sensing

✓ **نویسندگان:**

Kumar S., Lodhi D.K., Goel P., Neeti, Mishra P., Singh J.P.

✓ **خلاصه پژوهش:**

Our results demonstrate that it is possible, by means of generation of buckles on the silver nanorod (AgNR) array PDMS substrate, to enhance the Raman signal of P. aeruginosa bacteria due to the formation of high density 'hot spots' among the AgNR arrays which provides better entrapment and increases the net effective contact area of bacteria with the metal surface. © The Royal Society of Chemistry 2015.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/c5cc03604f

✓ **نام ژورنال:**

Chemical Communications

✓ **سال انتشار:**

2015

✓ **کلیدواژه‌ها:**

TEKSAN
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✓ **عنوان پژوهش:**

Surface-enhanced Raman scattering-based detection of the interactions between the essential cell division FtsZ protein and bacterial membrane elements

✓ **نویسندگان:**

Ahijado-Guzmán R., Gómez-Puertas P., Alvarez-Puebla R.A., Rivas G., Liz-Marzán L.M.

✓ **خلاصه پژوهش:**

Surface-enhanced Raman scattering (SERS) spectroscopy has been applied to detect the interaction of the FtsZ protein from Escherichia coli, an essential component of the bacterial division machinery, with either a soluble variant of the ZipA protein (that provides membrane tethering to FtsZ) or the bacterial membrane (containing the full-length ZipA naturally incorporated), on silver-coated polystyrene micrometer-sized beads. The engineered microbeads were used not only to support the bilayers but also to offer a stable support with a high density of SERS hot spots, allowing the detection of ZipA structural changes linked to the binding of FtsZ. These changes were different upon incubating the coated beads with FtsZ polymers (GTP form) as compared to oligomers (GDP form) and more pronounced when the plasmonic sensors were coated with natural bacterial membranes. © 2012 American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/nn302825u

✓ **نام ژورنال:**

ACS Nano

✓ **سال انتشار:**

2012

✓ **کلیدواژه‌ها:**

bacterial division; FtsZ; label-free sensors; protein-membrane interactions; SERS

✓ **عنوان پژوهش:**

Multiplex identification of bacteria in bacterial mixtures with surface-enhanced raman scattering

✓ **نویسندگان:**

Cam D., Keseroglu K., Kahraman M., Sahin F., Culha M.

✓ **خلاصه پژوهش:**

Surface-enhanced Raman scattering (SERS) is a technique capable of identifying each component in a mixture because of its intrinsically narrow spectral bands. In a clinical setting, the identification of bacteria from its initial culture by collecting the colonies on the culture plate significantly decreases the analysis time and the cost. The identification of bacteria from their mixtures is attempted using SERS. A simple mixing procedure of bacterial samples and concentrated colloidal suspension is proven to be mostly satisfactory for the generation of the reproducible SERS spectra that can be used for bacterial identification. The mixture of three different but related bacterial species Shigella sonnei, Proteus vulgaris, and Erwinia amylovara and three Escherichia coli strains (BFK13, BHK7, DH5 α) are used as model systems to test the feasibility of the approach. The results indicate that it is possible to identify the composition of a bacterial mixture. This approach can easilybe utilized for thebacteria originating from the same source with similar growth profiles.© 2009 John Wiley & Sons, Ltd.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/jrs.2475

✓ **نام ژورنال:**

Journal of Raman Spectroscopy

✓ **سال انتشار:**

2010

✓ **کلیدواژه‌ها:**

Bacteria; Multiplexing; SERS; Silver nanoparticles

✓ عنوان پژوهش:

Surface-enhanced resonance Raman scattering spectroscopy of bacterial photosynthetic membranes. The carotenoid of Rhodospirillum rubrum

✓ نویسندگان:

Picorel R., Holt R.E., Cotton T.M., Seibert M.

✓ خلاصه پژوهش:

Resonance Raman scattering by the carotenoid, spirilloxanthin (Spx), in a suspension of chromatophores (cytoplasmic side out) isolated from the photosynthetic bacterium, Rhodospirillum rubrum, is greatly enhanced when the membranes are adsorbed onto the surface of an anodized Ag electrode. The phenomenon is the basis for surface-enhanced resonance Raman scattering (SERRS) spectroscopy. The Spx SERRS peaks observed were at 1505-1510, 1150-1155, and 1000-1005 cm-1 with laser excitation wavelengths ranging between 457.9 and 568.2 nm. Similar peaks were not observed with spheroplasts (periplasmic side out) isolated from the same species. The difference in signal detected in chromatophores and spheroplasts is not due to differences in membrane surface charge, presence of residual cell wall on the spheroplast surface, lack of adhesion of spheroplasts to metals, or large differences in pigment content per unit membrane area. Instead, the results indicate an asymmetric distribution of Spx in vivo across the membrane (i.e. it is located on the cytoplasmic side of the membrane). The results also demonstrate that the SERRS effect is extremely distance sensitive, and the thickness of a single bacterial membrane (separating the Ag electrode from the carotenoid) is sufficient to prevent detection of Spx spectra. Studies of chromatophores from the F24 strain (a reaction centerless mutant) have pinpointed B880 antenna complex as the source of the Spx SERRS spectra, and a schematic model of the minimal structural unit of B880 is presented. This work demonstrates the potential of the SERRS technique as a probe for surface topology of pigmented membranes.

✓ لینک DOI (استفاده برای دانلود مقاله)

✓ نام ژورنال:

Journal of Biological Chemistry

✓ سال انتشار:

1988

✓ کلیدواژه‌ها:

✓ **عنوان پژوهش:**

Bacterial cell division regulation by Ser/Thr kinases: A structural perspective

✓ **نویسندگان:**

Ruggiero A., de Simone P., Smaldone G., Squeglia F., Berisio R.

✓ **خلاصه پژوهش:**

Recent genetic, biochemical and structural studies have established that eukaryotic-like Ser/Thr protein-kinases are critical mediators of developmental changes and host pathogen interactions in bacteria. Although with lower abundance compared to their homologues from eukaryotes, Ser/Thr protein-kinases are widespread in gram-positive bacteria. These data underline a key role of reversible Ser/Thr phosphorylation in bacterial physiology and virulence. Numerous studies have revealed how phosphorylation/dephosphorylation of Ser/Thr protein-kinases governs cell division and cell wall biosynthesis and that Ser/Thr protein kinases are responsible for distinct phenotypes, dependent on different environmental signals. In this review we discuss the current understandings of Ser/Thr protein-kinases functional processes based on structural data. © 2012 Bentham Science Publishers.

✓ **لینک** DOI **(استفاده برای دانلود مقاله)**

10.2174/138920312804871201

✓ **نام ژورنال:**

Current Protein and Peptide Science

✓ **سال انتشار:**

2012

✓ **کلیدواژه‌ها:**

Cell division; Peptidoglycan; Phosphorylation; Structure

✓ **عنوان پژوهش:**

Bacteria Detection: From Powerful SERS to Its Advanced Compatible Techniques

✓ **نویسندگان:**

Zhou X., Hu Z., Yang D., Xie S., Jiang Z., Niessner R., Haisch C., Zhou H., Sun P.

✓ **خلاصه پژوهش:**

The rapid, highly sensitive, and accurate detection of bacteria is the focus of various fields, especially food safety and public health. Surface-enhanced Raman spectroscopy (SERS), with the advantages of being fast, sensitive, and nondestructive, can be used to directly obtain molecular fingerprint information, as well as for the on-line qualitative analysis of multicomponent samples. It has therefore become an effective technique for bacterial detection. Within this progress report, advances in the detection of bacteria using SERS and other compatible techniques are discussed in order to summarize its development in recent years. First, the enhancement principle and mechanism of SERS technology are briefly overviewed. The second part is devoted to a label-free strategy for the detection of bacterial cells and bacterial metabolites. In this section, important considerations that must be made to improve bacterial SERS signals are discussed. Then, the label-based SERS strategy involves the design strategy of SERS tags, the immunomagnetic separation of SERS tags, and the capture of bacteria from solution and dye-labeled SERS primers. In the third part, several novel SERS compatible technologies and applications in clinical and food safety are introduced. In the final part, the results achieved are summarized and future perspectives are proposed. © 2020 The Authors. Published by Wiley-VCH GmbH

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/advs.202001739

✓ **نام ژورنال:**

Advanced Science

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

bacteria detection; compatible techniques; label-based; label-free; SERS

✓ **عنوان پژوهش:**

Experimental parameters influencing surface-enhanced Raman scattering of bacteria

✓ **نویسندگان:**

Kahraman M., Yazici M.M., Şahin F., Çulha M.

✓ **خلاصه پژوهش:**

Surface-enhanced Raman scattering SERS is a powerful technique for the analysis of a variety of molecules and molecular structures. Due to its great complexity, the acquisition of detailed molecular information from biological organizations such as bacteria is still a challenging task. SERS can provide valuable information once silver or gold surfaces can be brought in close contact with the biological organization. Because several experimental parameters can affect SERS spectra of bacteria, the experimental conditions must be well defined for comparable and reproducible results. The influence of experimental parameters, such as the type of noble metal, size, and aggregation properties of nanoparticles, and the wavelength of the laser light on the SERS of E. coli and B. megaterium are examined. It is demonstrated that the impact of these parameters could be enormous and a standard protocol must be developed depending on the goal of the study. © 2007 Society of Photo-Optical Instrumentation Engineers.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1117/1.2798640

✓ **نام ژورنال:**

Journal of Biomedical Optics

✓ **سال انتشار:**

2007

✓ **کلیدواژه‌ها:**

Bacteria; Colloids; Identification; Nanoparticles; Surface-enhanced Raman scattering

✓ **عنوان پژوهش:**

Surface-enhanced Raman scattering detection of bacteria on microarrays at single cell levels using silver nanoparticles

✓ **نویسندگان:**

Zhou H., Yang D., Mircescu N.E., Ivleva N.P., Schwarzmeier K., Wieser A., Schubert S., Niessner R., Haisch C.

✓ **خلاصه پژوهش:**

We describe a method for the synthesis of SERS-active silver nanoparticles (AgNPs) directly on the surface of bacteria (bacteria@AgNPs), specifically of E. coli cells. This straightforward strategy allows for the sensitive determination of bacteria on a microarray platform. Antibodies were used as selective receptors on the microarray surface. The Raman signal of bacteria@AgNPs is about 10 times higher than that obtained previously with microarrays based on mixing bacteria and AgNPs (bacteria+AgNPs). The optimum SERS enhancement of bacteria@AgNPs is obtained under 633-nm laser excitation, and this most likely is due to the plasmonic interaction of aggregated AgNPs. The method allows for an identification and quantification even of single E. coli bacteria. In our perception, this straightforward approach represents a most valuable tool for the detection of E. coli and, conceivably, of other bacteria, and thus has a large potential in environmental monitoring, medical diagnosis, and in food safety and quality control. [Figure not available: see fulltext.] © 2015, Springer-Verlag Wien.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1007/s00604-015-1570-0

✓ **نام ژورنال:**

Microchimica Acta

✓ **سال انتشار:**

2015

✓ **کلیدواژه‌ها:**

Bacteria; Biosensors; E. coli; Microarray; Microorganism; SERS; Single cell; Surface-enhanced Raman scattering

✓ **عنوان پژوهش:**

Imaging Bacterial Interspecies Chemical Interactions by Surface-Enhanced Raman Scattering

✓ **نویسندگان:**

Bodelón G., Montes-García V., Costas C., Pérez-Juste I., Pérez-Juste J., Pastoriza-Santos I., Liz-Marzán L.M.

✓ **خلاصه پژوهش:**

Microbes produce bioactive chemical compounds to influence the physiology and growth of their neighbors, and our understanding of their biological activities may be enhanced by our ability to visualize such molecules in vivo. We demonstrate here the application of surface-enhanced Raman scattering spectroscopy for simultaneous detection of quorum-sensing-regulated pyocyanin and violacein, produced respectively by Pseudomonas aeruginosa and Chromobacterium violaceum bacterial colonies, grown as a coculture on agar-based plasmonic substrates. Our plasmonic approach allowed us to visualize the expression and spatial distribution of the microbial metabolites in the coculture taking place as a result of interspecies chemical interactions. By combining surface-enhanced Raman scattering spectroscopy with analysis of gene expression we provide insight into the chemical interplay occurring between the interacting bacterial species. This highly sensitive, cost-effective, and easy to implement approach allows spatiotemporal imaging of cellular metabolites in live microbial colonies grown on agar with no need for sample preparation, thereby providing a powerful tool for the analysis of microbial chemotypes. © 2017 American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acsnano.7b00258

✓ **نام ژورنال:**

ACS Nano

✓ **سال انتشار:**

2017

✓ **کلیدواژه‌ها:**

bacteria; imaging; metabolite; plasmonic; quorum sensing; SERRS; SERS

✓ **عنوان پژوهش:**

Nanoparticle-based substrates for surface-enhanced Raman scattering detection of bacterial spores

✓ **نویسندگان:**

Cheng H.-W., Huan S.-Y., Yu R.-Q.

✓ **خلاصه پژوهش:**

The development of ultrasensitive and rapid methods for the detection of bacterial spores is important for medical diagnostics of infectious diseases. While Surface-Enhanced Raman Spectroscopic (SERS) techniques have been increasingly demonstrated for achieving this goal, a key challenge is the development of sensitive and stable SERS substrates or probes. This Minireview highlights recent progress in exploring metal nanoparticle-based substrates, especially gold nanoparticle-based substrates, for the detection of biomarkers released from bacterial spores. One recent example involves assemblies of gold nanoparticles on a gold substrate for the highly sensitive detection of dipicolinic acid (DPA), a biomarker for bacterial spores such as Bacillus anthracis. This type of substrate exploits a strong SERS effect produced by the particle-particle and particle-substrate plasmonic coupling. It is capable of accurate speciation of the biomarker but also selective detection under various reactive or non-reactive conditions. In the case of detecting Bacillus subtilis spores, the limit of detection is quite comparable (0.1 ppb for DPA, and 1.5 × 109 spores per L (or 2.5 × 10-14 M)) with those obtained using silver nanoparticle-based substrates. Implications of the recent findings for improving the gold nanoparticle-based SERS substrates with ultrahigh sensitivity for the detection of bacterial spores are also discussed. © 2012 The Royal Society of Chemistry.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/c2an35448a

✓ **نام ژورنال:**

Analyst

✓ **سال انتشار:**

2012

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

A flow-through microarray cell for the online SERS detection of antibody-captured E. coli bacteria

✓ **نویسندگان:**

Knauer M., Ivleva N.P., Niessner R., Haisch C.

✓ **خلاصه پژوهش:**

We present an immunoassay microarray flow-through system for the surface-enhanced Raman scattering (SERS) analysis of bacteria. The system has been constructed to support and automatize the nondestructive in situ analysis of different microorganisms in aqueous environment. After the immobilization of the desired antibodies to an activated PEG-coated surface, the chip is placed into the flow cell which is then flushed with the contaminated sample. Finally, colloidal metal nanoparticles are added and the cells are detected label-free by SERS. Here, we introduce the successful imaging of single microorganisms in the flow cell as well as the quantification of microorganisms in water by SERS mapping with a linear range between 4.3∈×∈103 to 4.3∈×∈105 cells/mL. The method has potential for routine application, e.g. for drinking water control. © 2011 Springer-Verlag.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1007/s00216-011-5398-0

✓ **نام ژورنال:**

Analytical and Bioanalytical Chemistry

✓ **سال انتشار:**

2012

✓ **کلیدواژه‌ها:**

Flow cell; Microarray; Microorganisms; SERS

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Detection and characterization of antibiotic-resistant bacteria using surface-enhanced raman spectroscopy

✓ **نویسندگان:**

Wang K., Li S., Petersen M., Wang S., Lu X.

✓ **خلاصه پژوهش:**

This mini-review summarizes the most recent progress concerning the use of surface-enhanced Raman spectroscopy (SERS) for the detection and characterization of antibiotic-resistant bacteria. We first discussed the design and synthesis of various types of nanomaterials that can be used as the SERS-active substrates for biosensing trace levels of antibiotic-resistant bacteria. We then reviewed the tandem-SERS strategy of integrating a separation element/platform with SERS sensing to achieve the detection of antibiotic-resistant bacteria in the environmental, agri-food, and clinical samples. Finally, we demonstrated the application of using SERS to investigate bacterial antibiotic resistance and susceptibility as well as the working mechanism of antibiotics based on spectral fingerprinting of the whole cells. © 2018 by the authors. Licensee MDPI, Basel, Switzerland.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.3390/nano8100762

✓ **نام ژورنال:**

Nanomaterials

✓ **سال انتشار:**

2018

✓ **کلیدواژه‌ها:**

Biosensing; Chemometrics; Rapid detection; Resistance; SERS

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Using surface enhanced raman scattering to analyze the interactions of protein receptors with bacterial quorum sensing modulators

✓ نویسندگان:

Costas C., López-Puente V., Bodelón G., González-Bello C., Pérez-Juste J., Pastoriza-Santos I., Liz-Marzán L.M.

✓ خلاصه پژوهش:

Many members of the LuxR family of quorum sensing (QS) transcriptional activators, including LasR of Pseudomonas aeruginosa, are believed to require appropriate acyl-homoserine lactone (acyl-HSL) ligands to fold into an active conformation. The failure to purify ligand-free LuxR homologues in nonaggregated form at the high concentrations required for their structural characterization has limited the understanding of the mechanisms by which QS receptors are activated. Surface-enhanced Raman scattering (SERS) is a vibrational spectroscopy technique that can be applied to study proteins at extremely low concentrations in their active state. The high sensitivity of SERS has allowed us to detect molecular interactions between the ligand-binding domain of LasR (LasRLBD) as a soluble apoprotein and modulators of P. aeruginosa QS. We found that QS activators and inhibitors produce differential SERS fingerprints in LasRLBD, and in combination with molecular docking analysis provide insight into the relevant interaction mechanism. This study reveals signal-specific structural changes in LasR upon ligand binding, thereby confirming the applicability of SERS to analyze ligand-induced conformational changes in proteins. © 2015 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acsnano.5b01800

✓ نام ژورنال:

ACS Nano

✓ سال انتشار:

2015

✓ کلیدواژه‌ها:

nanoplasmonics; protein receptors; Pseudomonas aeruginosa; quorum sensing; SERS

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Insertion mode of a novel anionic antimicrobial peptide MDpep5 (Val-Glu-Ser-Trp-Val) from Chinese traditional edible larvae of housefly and its effect on surface potential of bacterial membrane

✓ نویسندگان:

Tang Y.-L., Shi Y.-H., Zhao W., Hao G., Le G.-W.

✓ خلاصه پژوهش:

Antimicrobial molecules from insects may serve as a potentially significant group of antibiotics. To identify the effect of antimicrobial peptides (AMPs) on bacterial membrane and obtain further insight in the mechanism of membrane transport of AMPs, the interaction of surface potential and permeation of a novel antimicrobial peptide MDpep5 (Val-Glu-Ser-Trp-Val) from Chinese traditional edible larvae of housefly was examined using liposomes from bacterial lipids extract. Compared with the cationic AMPs, MDpep5 cannot completely disrupt membrane. The uptake of MDpep5 by bacterial liposomes was dependent on the membrane surface potential. The mutual inhibition of the transport of MDpep5 through the cell membrane was caused by the change in surface potential due to the binding of MDpep5 to the membrane. Furthermore, formation of MDpep5-enriched lipid aggregates could lead to the disorder of the bilayer structure. Based on our experimental data, we propose that MDpep5 initiated its antimicrobial activity by profoundly disordering the structure and affecting physical properties of bacterial membrane when binding to the phospholipid which accounts for its bactericidal activity. © 2008 Elsevier B.V. All rights reserved.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.jpba.2008.09.006

✓ نام ژورنال:

Journal of Pharmaceutical and Biomedical Analysis

✓ سال انتشار:

2008

✓ کلیدواژه‌ها:

Antimicrobial; Fluorescence; Lipid extract; Surface potential; Transmembrane

✓ **عنوان پژوهش:**

Bacterial resistance to vancomycin: Overproduction, purification, and characterization of VanC2 from Enterococcus casseliflavus as a D-Ala-D-Ser ligase

✓ **نویسندگان:**

Park I.-S., Lin C.-H., Walsh C.T.

✓ **خلاصه پژوهش:**

The VanC phenotype for clinical resistance of enterococci to vancomycin is exhibited by Enterococcus gallinarum and Enterococcus casseliflavus. Based on the detection of the cell precursor UDP-N-acetylmuramic acid pentapeptide intermediate terminating in D-Ala-D-Ser instead of D-Ala-D-Ala, it has been predicted that the VanC ligase would be a D-Ala-D-Ser rather than a D-Ala-D- Ala ligase. Overproduction of the E. casseliflavus ATCC 25788 vanC2 gene in Escherichia coli and its purification to homogeneity allowed demonstration of ATP-dependent D-Ala-D-Ser ligase activity. The k(cat)/K(m2) (K(m2) = K(m) for D-Ser or C-terminal D-Ala) ratio for D-Ala-D-Ser/D-Ala-D-Ala dipeptide formation is 270/0.69 for a 400-fold selection against D-Ala in the C- terminal position. VanC2 also has substantial D-Ala-D-Asn ligase activity (k(cat)/K(m2) = 74 mM-1min-1).

✓ **لینک** DOI **(استفاده برای دانلود مقاله)**

10.1073/pnas.94.19.10040

✓ **نام ژورنال:**

Proceedings of the National Academy of Sciences of the United States of America

✓ **سال انتشار:**

1997

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Fabrication of Ag@TiO2 electrospinning nanofibrous felts as SERS substrate for direct and sensitive bacterial detection

✓ نویسندگان:

Yang Y., Zhang Z., He Y., Wang Z., Zhao Y., Sun L.

✓ خلاصه پژوهش:

In order to develop a novel method for bacteria detection, Ag@TiO2 electrospinning Nanofibrous felts have been fabricated by in situ decoration of size tunable Ag nanoparticles on anatase TiO2 nanofibers. The morphologies and structures of the as-prepared Ag@TiO2 electrospinning nanofibrous felts were characterized by techniques of scanning electron microscopy, energy-dispersive X-ray spectroscopy, transmission electron microscopy, and X-ray diffraction. The result show that Ag NPs were uniformly deposited on the surfaces of TiO2 nanofibers, especially when the deposition time in Tollens' reagent was 10 min. The free-standing composite nanofibrous felts processes superb performance of surface enhanced Raman scattering, which was demonstrated by small probe mecules of 4-mercaptobenzoic acid and 4-mercaptophenol, and the lowest detection limit was near to10–9 mol/L. More importantly, the as-fabricated Ag@TiO2 nanofibrous felts as SERS substrate can detect biomacromolecules such as bacteria of Escherichia coli (E. coli) and Staphylococcus aureus (S. aureus) directly without previous bacteria-aptamer conjugation as the traditonal process. In addition, the composite nanofibrous felts also show outstanding antimicrobial activities against both Gram-negative of E. coli and Gram-positive of S. aureus, evaluated by method of absorption and microscopic observation. The results show that the bacteriostasis rate is reached to 99%, especially significant for E. coli. The free-standing, high porous, and flexible substrate of Ag@TiO2 electrospun nanofibrous membranes have potential application in versatile fields such as microorganism sensors and water purifier. © 2018 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.snb.2018.05.129

✓ نام ژورنال:

Sensors and Actuators, B: Chemical

✓ سال انتشار:

2018

✓ کلیدواژه‌ها:

Ag nanoparticles; Electrospinning; Microbiological detection; SERS substrates; TiO2 nanofibers

✓ **عنوان پژوهش:**

Electrospun polymer mat as a SERS platform for the immobilization and detection of bacteria from fluids

✓ **نویسندگان:**

Szymborski T., Witkowska E., Adamkiewicz W., Waluk J., Kaminska A.

✓ **خلاصه پژوهش:**

This work demonstrates the development of a new class of SERS substrates that allows for the simultaneous: (i) filtration of bacteria from any solution (blood, urine, water, or milk), (ii) immobilization of bacteria on the SERS platform, and (iii) enhancing the Raman signal of bacteria. The proposed platform is based on an electrospun polymer mat covered with a 90 nm layer of gold. © 2014 the Partner Organisations.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/c4an01137f

✓ **نام ژورنال:**

Analyst

✓ **سال انتشار:**

2014

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

A large family of eukaryotic-like protein Ser/Thr kinases of Myxococcus xanthus, a developmental bacterium

✓ **نویسندگان:**

Inouye S., Jain R., Ueki T., Nariya H., Xu C.-Y., Hsu M.-Y., Fernandez-Luque B.A., Munoz-Dorado J., Farez-Vidal E., Inouye M.

✓ **خلاصه پژوهش:**

Myxococcus xanthus is a gram-negative bacterium that forms multicellular fruiting bodies upon starvation. Here, we demonstrate that it contains at least 13 eukaryotic-like protein Ser/Thr kinases (Pkn1 to Pkn13) individually having unique features. All contain the kinase domain of approximately 280 residues near the N-terminal end, which share highly conserved features in eukaryotic Ser/Thr kinases. The kinase domain is followed by a putative regulatory domain consisting of 185 to 692 residues. These regulatory domains share no significant sequence similarities. The C-terminal regions of 11 kinases contain at least 1 transmembrane domain, suggesting that they function as transmembrane sensor kinases. From the recent genomic analysis, protein Ser/Thr kinases were found in various pathogenic bacteria and coexist with protein His kinases. Phylogenetic analysis of these Ser/Thr kinases reveals that all bacterial Ser/Thr kinases were evolved from a common ancestral kinase together with eukaryotic Tyr and Ser/Thr kinases. Coexistence of both Ser/Thr and His kinases in some organisms may be significant in terms of functional differences between the two kinases. We argue that both kinases are essential for some bacteria to adapt optimally to severe environmental changes.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1089/10906590050179783

✓ **نام ژورنال:**

Microbial and Comparative Genomics

✓ **سال انتشار:**

2000

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Structural basis for the nucleic acid binding cooperativity of bacteriophage T4 gene 32 protein: The (Lys/Arg)3(Ser/Thr)2 (LAST) motif

✓ نویسندگان:

Casas-Finet J.R., Fischer K.R., Karpel R.L.

✓ خلاصه پژوهش:

To identify the functional residues of the N-terminal B region of bacteriophage T4 gene 32 protein involved in its cooperative binding to single-stranded nucleic acids, a process dependent on homotypic protein-protein interaction, we have studied the interaction of the protein with synthetic peptides containing different portions of this domain. Gel-permeation chromatography showed that a 6-acryloyl-2-dimethylaminonaphthalene (acrylodan)-labeled fluorescent peptide corresponding to the first 17 residues of gene 32 protein formed a complex with whole protein. The fluorescence was blue-shifted 14 nm upon interaction with intact protein, and somewhat less so (7-11 nm) with cleavage products of the protein lacking B domains. The intrinsic tryptophan fluorescence of whole and truncated protein was quenched by this peptide and by the nonderivatized peptide. The peptide bound tightly to truncated protein at both 0.015 and 0.44 M Na+, with a stoichiometry of 1:1. Similar tryptophan quenching or acrylodan blue shifts were obtained with peptides corresponding to residues 1-9 and 3-8, but not residues 1-4, 5-9, or 5-17, indicating that the essential amino acids are contained within positions 3-8, Lys-Arg-Lys-Ser-Thr-Ala. Several other DNA binding proteins contain a LAST motif with documented involvement of these residues in nucleic acid interaction. The amino acid and coding sequence of residues 110-114, a region proposed to be involved in nucleic acid binding, is virtually identical to that of residues 3-7. Based on these observations, we have formulated a model for the cooperative interactions of gene 32 protein with single-stranded nucleic acids.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1073/pnas.89.3.1050

✓ نام ژورنال:

Proceedings of the National Academy of Sciences of the United States of America

✓ سال انتشار:

1992

✓ کلیدواژه‌ها:

✓ عنوان پژوهش:

A novel strategy for rapid detection of bacteria in water by the combination of three-dimensional surface-enhanced Raman scattering (3D SERS) and laser induced breakdown spectroscopy (LIBS)

✓ نویسندگان:

Liao W., Lin Q., Xie S., He Y., Tian Y., Duan Y.

✓ خلاصه پژوهش:

In this study, a novel strategy based on the combination of 3D SERS and LIBS was developed for qualitative and quantitative detection of bacteria. SERS-active Ag nanoparticles (AgNPs) were prepared by an improved in situ synthesis method, and reproducible SERS spectra of bacteria were obtained by natural evaporation of a droplet of the in situ synthesized sample. Four types of bacteria were classified via principal component analysis (PCA) and hierarchy cluster analysis (HCA). LIBS acted as a quantitative technique for bacterial detection based on the intracellular mineral cations, and bacteria could be detected in a linear range of 5 × 103–5 × 107 CFU mL−1, with recovery values ranging from 81.0% to 101.7%. The whole detection process including sample preparation and detection could be completed in approximately 30 min. With short assay time and simple operation, the proposed strategy has showed great potential for bacterial analysis.
© 2018 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.aca.2018.06.058

✓ نام ژورنال:

Analytica Chimica Acta

✓ سال انتشار:

2018

✓ کلیدواژه‌ها:

3D SERS; Bacterial detection; In situ synthesis; LIBS; LIBS-Raman combined platform

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

SERS study of bacteria using biosynthesized silver nanoparticles as the SERS substrate

✓ **نویسندگان:**

Ankamwar B., Sur U.K., Das P.

✓ **خلاصه پژوهش:**

Surface-enhanced Raman scattering (SERS) spectroscopy has great advantages as a spectroscopic analytical tool due to the large enhancement of the weak Raman signal and thereby facilitates suitable identification of chemical and biological systems. SERS can be utilized as a powerful tool to identify pathogens like bacteria. However, it is difficult to fabricate a homogeneous SERS active substrate in biosensing applications to obtain a uniform, stable and highly reproducible SERS signal. In this paper, we have used biosynthesized silver nanoparticles as the SERS active substrate to identify bacteria with different cell wall compositions. The silver nanoparticles were synthesized using the leaf extract of Neolamarckia cadamba as the source of reducing and stabilizing agents. The pathogen detection by using the SERS technique using biosynthesized silver nanoparticles represents a novel approach for rapid microbial diagnostics, where SERS can be directly applied to clinical samples rather than pure cultured bacteria. © The Royal Society of Chemistry 2016.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/c5ay03014e

✓ **نام ژورنال:**

Analytical Methods

✓ **سال انتشار:**

2016

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Rapid identification of bacteria utilizing amplified dielectrophoretic force-assisted nanoparticle-induced surface-enhanced Raman spectroscopy

✓ نویسندگان:

Cheng I.-F., Chen T.-Y., Lu R.-J., Wu H.-W.

✓ خلاصه پژوهش:

Dielectrophoresis (DEP) has been widely used to manipulate, separate, and concentrate microscale particles. Unfortunately, DEP force is difficult to be used in regard to the manipulation of nanoscale molecules/particles. For manipulation of 50- to 100-nm particles, the electrical field strength must be higher than 3 × 106 V/m, and with a low applied voltage of 10 Vp-p, the electrode gap needs to be reduced to submicrons. Our research consists of a novel and simple approach, using a several tens micrometers scale electrode (low cost and easy to fabricate) to generate a dielectrophoretic microparticle assembly to form nanogaps with a locally amplified alternating current (AC) electric field gradient, which is used to rapidly trap nanocolloids. The results show that the amplified DEP force could effectively trap 20-nm colloids in the nanogaps between the 5-μm particle aggregates. The concentration factor at the local detection region was shown to be approximately 5 orders of magnitude higher than the bulk solution. This approach was also successfully used in bead-based surface-enhanced Raman spectroscopy (SERS) for the rapid identification of bacteria from diluted blood. © 2014 Cheng et al.; licensee Springer.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1186/1556-276X-9-324

✓ نام ژورنال:

Nanoscale Research Letters

✓ سال انتشار:

2014

✓ کلیدواژه‌ها:

Dielectrophoresis; Microparticle assembly; Surface-enhanced Raman spectroscopy

✓ عنوان پژوهش:

Preparation of Au@Ag core-shell nanoparticle decorated silicon nanowires for bacterial capture and sensing combined with laser induced breakdown spectroscopy and surface-enhanced Raman spectroscopy

✓ نویسندگان:

Liao W., Lin Q., Xu Y., Yang E., Duan Y.

✓ خلاصه پژوهش:

Three-dimensional nano-biointerfaces, emerging as significant cell-guiding platforms, have attracted great attention. Nevertheless, complicated chemical modifications and instability of bio-ligands limit their widespread application. In this study, a novel biointerface, based on silicon nanowires (SiNWs) array, was prepared for bacterial capture and sensing. Vertically aligned SiNWs were fabricated via metal assisted chemical etching and decorated with uniform Au@Ag core-shell nanoparticles (Au@Ag NPs). These deposited Au@Ag NPs formed multi-scale topographic structures with nanowires, which provided effective attachment sites for bacterial adhesins. In addition, the Au cores of Au@Ag NPs enhanced the activity of the surface silver atoms and promoted the binding of Au@Ag NPs to bacteria. Thus, the Au@Ag NPs decorated SiNWs (SiNWs-Au@Ag) substrate exhibited high capture capacity for bacteria in drinking water (8.6 and 5.5 × 10 6 cells per cm 2 for E. coli and S. aureus in 40 min, respectively) via physical and chemical effects. Bacteria in drinking water can be sensitively detected by using a combination of laser induced breakdown spectroscopy (LIBS) and label based surface-enhanced Raman spectroscopy (SERS) techniques. Due to the antibacterial activity of Au@Ag NPs and the physical stress exerted on SiNWs, the prepared biointerface also showed high antibacterial rates towards both Gram-positive and Gram-negative bacteria strains. With these excellent properties, the flexible sensing platform might open a new avenue for the prevention and control of microbial hazards in water. © The Royal Society of Chemistry.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1039/c9nr00019d

✓ نام ژورنال:

Nanoscale

✓ سال انتشار:

2019

✓ کلیدواژه‌ها:

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Bare laser-synthesized Au-based nanoparticles as nondisturbing surface-enhanced Raman scattering probes for bacteria identification

✓ نویسندگان:

Kögler M., Ryabchikov Y.V., Uusitalo S., Popov A., Popov A., Tselikov G., Välimaa A.-L., Al-Kattan A., Hiltunen J., Laitinen R., Neubauer P., Meglinski I., Kabashin A.V.

✓ خلاصه پژوهش:

The ability of noble metal-based nanoparticles (NPs) (Au, Ag) to drastically enhance Raman scattering from molecules placed near metal surface, termed as surface-enhanced Raman scattering (SERS), is widely used for identification of trace amounts of biological materials in biomedical, food safety and security applications. However, conventional NPs synthesized by colloidal chemistry are typically contaminated by nonbiocompatible by-products (surfactants, anions), which can have negative impacts on many live objects under examination (cells, bacteria) and thus decrease the precision of bioidentification. In this article, we explore novel ultrapure laser-synthesized Au-based nanomaterials, including Au NPs and AuSi hybrid nanostructures, as mobile SERS probes in tasks of bacteria detection. We show that these Au-based nanomaterials can efficiently enhance Raman signals from model R6G molecules, while the enhancement factor depends on the content of Au in NP composition. Profiting from the observed enhancement and purity of laser-synthesized nanomaterials, we demonstrate successful identification of 2 types of bacteria (Listeria innocua and Escherichia coli). The obtained results promise less disturbing studies of biological systems based on good biocompatibility of contamination-free laser-synthesized nanomaterials. (Figure presented.). © 2018 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1002/jbio.201700225

✓ نام ژورنال:

Journal of Biophotonics

✓ سال انتشار:

2018

✓ کلیدواژه‌ها:

bacteria detection; laser ablation in liquids; Raman spectroscopy; SERS; ultrapure laser-synthesized Au nanoparticles

✓ عنوان پژوهش:

Rapid detection and identification of bacterial meningitis pathogens in: Ex vivo clinical samples by SERS method and principal component analysis

✓ نویسندگان:

Kamińska A., Witkowska E., Kowalska A., Skoczyńska A., Ronkiewicz P., Szymborski T., Waluk J.

✓ خلاصه پژوهش:

Three of the most common meningitis pathogens, Neisseria meningitidis, Haemophilus influenzae, and Streptococcus pneumoniae, have been successfully detected and identified in clinical cerebrospinal fluid (CSF) samples using a new class of a surface-enhanced Raman scattering (SERS) assay. Bacterial meningitis is a disease of the nervous system that is extremely serious and often fatal (an inflammation encompasses the lining around the brain and spinal cord). The approach presented in this study challenges the current SERS-based method of microorganism detection in terms of sensitivity and, more importantly, reveals a simple, quick (on a timescale of seconds), label-free detection of multiple components from very small volumes of clinical samples. This new SERS class of assay, based on the combination of two types of Au/Ag-coated, nuclepore track-etched polycarbonate membranes, allow simultaneous filtration of CSF and immobilization of CSF components, enhancing their Raman signals and enabling detection of the spectra of a single bacteria cell present in the analyzed CSF samples. The multivariate statistical method, principal component analysis (PCA), was applied (i) to extract the biochemical information from the recorded bacterial spectra, (ii) to perform the statistical classification of analyzed microorganisms, and, finally, (iii) to identify the spectrum of an unknown sample by comparing it to the library of known bacterial spectra. The three meningitis pathogens, namely, N. meningitidis, H. influenzae, and S. pneumoniae, were detected and identified simultaneously using a label-free SERS method. This method of detection produces consistent results faster and cheaper than traditional laboratory techniques and demonstrates the powerful potential of SERS technique in medical applications. Additionally, the present study was undertaken to evaluate the CSF neopterin level in patients with diagnosed meningococcal meningitis. The results of this study confirmed that bacterial meningitis caused by N. meningitidis, H. influenzae, and S. pneumoniae is associated with elevated cerebrospinal fluid neopterin levels compared with control CSF samples. The neopterin concentration can be used to predict meningitis, but cannot be applied to qualify the species of bacteria inducing the meningitis infection. © 2016 The Royal Society of Chemistry.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1039/c6ay01018k

✓ نام ژورنال:

Analytical Methods

✓ سال انتشار:

2016

✓ کلیدواژه‌ها:

✓ عنوان پژوهش:

Pathway of Proton Transfer in Bacterial Reaction Centers: Further Investigations on the Role of Ser-L223 Studied by Site-Directed Mutagenesis

✓ نویسندگان:

Paddock M.L., Feher G., Okamura M.Y.

✓ خلاصه پژوهش:

The role of Ser-L223 in proton transfer to reduced QB in the reaction center (RC) from Rhodobacter sphaeroides was studied by site-directed replacement of Ser with residues having different proton donor properties, e.g., the aliphatic residues Ala and Gly, the hydroxyl residue Thr, the amide residue Asn, the sulhydryl residue Cys, the imidazole residue His, and the carboxylic acid residue Asp. Compared to native reaction centers, RCs with Ala or Asn at L223 had greatly reduced (~300-fold) proton-coupled electron transfer rates, kAB(2), associated with the second electron reduction of QB (QA-QB- + H+→ QAQBH-). In contrast, RCs containing Thr, Asp, or Gly at L223 retained fast proton-coupled electron transfer rates. RCs with His or Cys at L223 did not bind the secondary quinone QB. These results show that kAB(2) is larger when a good proton transfer group, e.g., a hydroxyl residue (Ser, Thr) or a carboxylic acid (Asp), occupies the L223 site, supporting the proposal that Ser-L223 is a component of a proton transfer chain [Paddock, M. L., McPherson, P. H., Feher, G., & Okamura, M. Y. (1990) Proc. Natl. Acad. Sci. U.S.A. 87, 6803-6807], The surprising result that kAB(2) is not significantly reduced in RCs with Gly at L223 suggests that a water molecule functionally replaces the missing Ser hydroxyl group in the mutant RCs. The importance of Ser-L223 in internal proton transfer reactions within the RC is discussed. © 1995, American Chemical Society. All rights reserved.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/bi00048a019

✓ نام ژورنال:

Biochemistry

✓ سال انتشار:

1995

✓ کلیدواژه‌ها:

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Recent advances in surface-enhanced Raman scattering-based microdevices for point-of-care diagnosis of viruses and bacteria

✓ نویسندگان:

Chen H., Das A., Bi L., Choi N., Moon J.-I., Wu Y., Park S., Choo J.

✓ خلاصه پژوهش:

This minireview reports the recent advances in surface-enhanced Raman scattering (SERS)-based assay devices for the diagnosis of infectious diseases. SERS-based detection methods have shown promise in overcoming the low sensitivity and multiplex detection problems inherent to fluorescence detection. Therefore, it is interesting to investigate the current status, challenges, and applications associated with SERS-based microdevices for the point-of-care (POC) diagnosis of infectious diseases. The majority of this review highlights three different types of microdevices, namely microfluidic channels, lateral flow assay strips, and three-dimensional nanostructured substrates. Furthermore, the integration of portable Raman spectrophotometry with microdevices provides an ideal platform for the diagnosis of various infectious diseases in the field. Integrated SERS-based assay systems also enable measurements in minimal sample volumes and at low analyte concentrations of viral or bacterial samples. A significant number of studies using the SERS-based assay system have been performed recently to realize POC diagnostics, especially under resource-limited conditions. This portable SERS sensor is expected to be a next-generation POC assay system that could overcome the limitations of current fluorescence-based assay systems. This minireview summarizes recent advances in the development of SERS-based microdevices for the diagnosis of infectious diseases. Lastly, challenges to overcome and future perspectives are discussed. © The Royal Society of Chemistry.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1039/d0nr06340a

✓ نام ژورنال:

Nanoscale

✓ سال انتشار:

2020

✓ کلیدواژه‌ها:

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

SERS substrates fabricated using ceramic filters for the detection of bacteria

✓ **نویسندگان:**

Mosier-Boss P.A., Sorensen K.C., George R.D., Obraztsova A.

✓ **خلاصه پژوهش:**

SERS substrates were fabricated by filtering either Ag or Au colloidal particles onto rigid, ceramic filters - onto which suspensions of bacteria were then filtered. SERS spectra of the bacteria were obtained using a Raman spectrometer that has an 'orbital raster scan' capability. It was shown that bacteria samples prepared in this manner were uniformly distributed onto the surface of the SERS substrate. The effect of common buffer systems on the SERS spectra was investigated and the utility of using the SERS technique for speciation of bacteria was explored.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.saa.2015.09.012

✓ **نام ژورنال:**

Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy

✓ **سال انتشار:**

2016

✓ **کلیدواژه‌ها:**

bacteria; ceramic filter; orbital raster scan; SERS

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

Reproducible discrimination between Gram-positive and Gram-negative bacteria using surface enhanced Raman spectroscopy with infrared excitation

✓ **نویسندگان:**

Prucek R., Ranc V., Kvítek L., Panáček A., Zbořil R., Kolář M.

✓ **خلاصه پژوهش:**

The on time diagnostics of bacterial diseases is one of the essential steps in the foregoing treatment of such pathogens. Here we sought to present an easy to use and robust method for the discrimination between Gram-positive (Enterococcus faecalis and Streptococcus pyogenes) and Gram-negative (Acinetobacter baumannii and Klebsiella pneumoniae) bacterial genera based on surface enhanced Raman scattering (SERS) spectroscopy. The robustness of our approach lies in the novel method for the production of the SER substrate based on silver nanoparticles and their subsequent re-crystallization in solutions containing high concentrations of chloride ions. The method presented here could be an interesting alternative both to commonly used histochemical approaches and commercial SERS substrates. © 2012 The Royal Society of Chemistry.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1039/c2an16310a

✓ **نام ژورنال:**

Analyst

✓ **سال انتشار:**

2012

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Bacterial mixture identification using Raman and surface-enhanced Ramanchemical imaging

✓ **نویسندگان:**

Guicheteau J., Christesen S., Emge D., Tripathi A.

✓ **خلاصه پژوهش:**

The ability of normal Raman and surface-enhanced Raman scattering (SERS) toidentify and detect bacteria has shown great success in recent studies. Theaddition of silver nanoparticles to bacterial samples not only results in anenhanced Raman signal, but it also suppresses the native fluorescence associatedwith biological material. In this report, Raman chemical imaging (RCI) was usedto analyze individual bacteria and complex mixtures of spores and vegetativecells. RCI uses every pixel or a binned pixel group (BPG) of the Raman camera asan independent Raman spectrograph, allowing collection of spatially resolvedRaman spectra. The advantage of this technique resides primarily in the analysisof samples in complex backgrounds without the need for physically isolating orpurifying the sample. Using a chemical imaging Raman microscope, we comparenormal RCI to SERS-assisted chemical imaging of mixtures of bacteria. In bothcases, we are able to differentiate single bacterium in the Raman microscope'sfield of view, with a 60-fold reduction in image acquisition time and a factorof 10 increase in the signal-to-noise ratio for SERS chemical imaging overnormal RCI. Copyright © 2010 John Wiley & Sons, Ltd.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/jrs.2601

✓ **نام ژورنال:**

Journal of Raman Spectroscopy

✓ **سال انتشار:**

2010

✓ **کلیدواژه‌ها:**

bacillus; PCA; Raman chemical imaging; surface-enhanced Raman

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

SERS-active Au@Ag core-shell nanorod (Au@AgNR) tags for ultrasensitive bacteria detection and antibiotic-susceptibility testing

✓ **نویسندگان:**

Bi L., Wang X., Cao X., Liu L., Bai C., Zheng Q., Choo J., Chen L.

✓ **خلاصه پژوهش:**

There is a challenge to obtain an ultrasensitive and rapid approach to detect bacteria and identify resistance. As a powerful bioanalytical tool, surface-enhanced Raman scattering (SERS) in bacterial detection have attracted increasing attentions. Herein, we developed a SERS-active Au@Ag core-shell nanorod (Au@AgNR) tag platform for ultrasensitive bacteria detection and antibiotic-susceptibility testing (AST). The platform established that surface enhanced Raman scattered Rhodamine 6G (R6G) absorption at 1517 cm−1 had a good linearity (RI = 3865 + 193logC; R2 = 0.97) with logarithm of E. coli concentration over a range of 107–102 CFU (colony forming unit)/mL with limit of detection as low 102 CFU/mL. When E. coli was exposed to ampicillin at minimum inhibitory concentration (MIC, 4 μg/mL), Raman spectroscopy showed the obvious variation between ampicillin-susceptible E. coli (Amp−-E. coli) and the ampicillin-resistant E. coli (Amp+-E. coli). Combined with principal component analysis (PCA) statistical analysis, the Raman intensity variation mentioned above allows to obtain rapid antibiotic resistance testing (<3.5 h). In addition, E.coli spiked into blood from C57BL/6 mice can be identified clearly, indicating the potential for point-of-care diagnostics. © 2020

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.talanta.2020.121397

✓ **نام ژورنال:**

Talanta

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

Antibiotic susceptibility testing; Au@AgNR; Minimum inhibitory concentration; Principal component analysis; SERS nanotag

✓ **عنوان پژوهش:**

Electrochemical Surface-Enhanced Raman Spectroscopy as a Platform for Bacterial Detection and Identification

✓ **نویسندگان:**

Lynk T.P., Sit C.S., Brosseau C.L.

✓ **خلاصه پژوهش:**

The field of bacterial screening is in need of a rapid, easy to use, sensitive, and selective platform for bacterial detection and identification. Current methods of bacterial identification lack time efficiency, resulting in problems for many sectors of society. Surface-enhanced Raman spectroscopy (SERS) has been investigated as a possible candidate for bacterial screening due to its demonstrated ability to detect biological molecules with a high degree of sensitivity. However, the field of bacterial screening using SERS is currently facing limitations such as signal irreproducibility, weak spectra, and difficulty differentiating between strains based on the SERS spectra of bacteria alone. The current study reports on the first ever use of electrochemical surface-enhanced Raman spectroscopy (EC-SERS) for bacterial screening. The results of this study demonstrate the ability of EC-SERS to greatly improve upon the SERS performance for the detection of Gram-positive and Gram-negative bacteria both in terms of improved peak intensities and spectral richness. EC-SERS shows great promise in its ability to advance SERS-based bacterial screening and could potentially be used for more efficient species discrimination at the point-of-need (PON). © 2018 American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acs.analchem.8b02806

✓ **نام ژورنال:**

Analytical Chemistry

✓ **سال انتشار:**

2018

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Multifunctional nanocomplex for surface-enhanced Raman scattering imaging and near-infrared photodynamic antimicrobial therapy of vancomycin-resistant bacteria

✓ نویسندگان:

Zhou Z., Peng S., Sui M., Chen S., Huang L., Xu H., Jiang T.

✓ خلاصه پژوهش:

Since vancomycin (Van)-resistant enterococci (VRE) strains first emerged as a serious threat to public health, extensive studies focused on optical imaging and antimicrobial therapy have been performed for monitoring and microbiological control. In this study, we developed silicon 2,3-naphthalocyanine dihydroxide (Nc) and Van functionalized silica-encapsulated, silver-coated gold nanoparticles (Au@AgNP@SiO2@Nc-Van) as a novel theranostic system for surface-enhanced Raman scattering (SERS) detection and antimicrobial photodynamic therapy (aPDT) of VRE strains. The silver-coated gold nanoparticle, as the SERS-active core, exhibited excellent Raman enhancement efficacy. Results of in vitro bacterial SERS imaging revealed Van-enhanced specific binding affinity toward VRE. Meanwhile, Si(IV) naphthalocyanine, serving as a near-infrared (NIR) photosensitizer, was axially linked to the nanoparticle surface, yielding nanostructured hybrid materials that could photoinactivate VRE. Almost 4–5 logs of bacterial reduction were obtained upon in vitro photodynamic therapy of VRE treated with a nanomolar concentration of the nanocomplex. Mouse infection assays were applied for an in vivo evaluation of VRE lethality. Upon near-infrared light irradiation, this hybrid nanomaterial caused obvious infection regression and even complete eradication compared to the findings in the non-treated groups. Therefore, this novel nanosystem integrating SERS imaging and noninvasive aPDT has huge potential for applications in theranostics with regard to VRE management. © 2017

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.colsurfb.2017.11.005

✓ نام ژورنال:

Colloids and Surfaces B: Biointerfaces

✓ سال انتشار:

2018

✓ کلیدواژه‌ها:

Antimicrobial photodynamic therapy; Multifunctional nanoparticles; SERS imaging; Silver-coated gold nanoparticles; Vancomycin-resistant enterococci

✓ **عنوان پژوهش:**

Bacteria-induced aggregation of bioorthogonal gold nanoparticles for SERS imaging and enhanced photothermal ablation of Gram-positive bacteria

✓ **نویسندگان:**

Wang H., Ouyang W., Zhang X., Xue J., Lou X., Fan R., Zhao X., Shan L., Jiang T.

✓ **خلاصه پژوهش:**

The challenge in antimicrobial photothermal therapy (PTT) is to develop strategies for decreasing the damage to cells and increasing the antibacterial efficiency. Herein, we report a novel theranostic strategy based on bacteria-induced gold nanoparticle (GNP) aggregation, in which GNPs in situ aggregated on the bacterial surface via specific targeting of vancomycin and bioorthogonal cycloaddition. Plasmonic coupling between adjacent GNPs exhibited a strong "hot spot" effect, enabling effective surface enhanced Raman scattering (SERS) imaging of bacterial pathogens. More importantly, in situ aggregation of GNPs showed strong NIR adsorption and high photothermal conversion, allowing enhanced photokilling activity against Gram-positive bacteria. In the absence of bacterial strains, GNPs were dispersed and showed a very low photothermal effect, minimizing the side effects towards surrounding healthy tissues. Given the above advantages, the bioorthogonal theranostic strategy developed in this study may find potential applications in treating bacterial infection and even multidrug-resistant bacteria. © The Royal Society of Chemistry 2019.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/c9tb00845d

✓ **نام ژورنال:**

Journal of Materials Chemistry B

✓ **سال انتشار:**

2019

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Self-Assembly of Au@Ag Nanoparticles on Mussel Shell to Form Large-Scale 3D Supercrystals as Natural SERS Substrates for the Detection of Pathogenic Bacteria

✓ نویسندگان:

Yuan K., Zheng J., Yang D., Jurado Sánchez B., Liu X., Guo X., Liu C., Dina N.E., Jian J., Bao Z., Hu Z., Liang Z., Zhou H., Jiang Z.

✓ خلاصه پژوهش:

Herein, we developed a natural surface-enhanced Raman scattering (SERS) substrate based on size-tunable Au@Ag nanoparticle-coated mussel shell to form large-scale three-dimensional (3D) supercrystals (up to 10 cm2) that exhibit surface-laminated structures and crossed nanoplates and nanochannels. The high content of CaCO3 in the mussel shell results in superior hydrophobicity for analyte enrichment, and the crossed nanoplates and nanochannels provided rich SERS hot spots, which together lead to high sensitivity. Finite-difference time-domain simulations showed that nanoparticles in the channels exhibit apparently a higher electromagnetic field enhancement than nanoparticles on the platelets. Thus, under optimized conditions (using Au@AgNPs with 5 nm shell thickness), highly sensitive SERS detection with a detection limit as low as 10-9 M for rhodamine 6G was obtained. Moreover, the maximum electromagnetic field enhancement of different types of 3D supercrystals shows no apparent difference, and Au@AgNPs were uniformly distributed such that reproducible SERS measurements with a 6.5% variation (613 cm-1 peak) over 20 spectra were achieved. More importantly, the as-prepared SERS substrates can be utilized for the fast discrimination of Escherichia coli, Staphylococcus aureus, and Pseudomonas aeruginosa by discriminant analysis. This novel Au@Ag self-assembled mussel shell template holds considerable promise as low-cost, durable, sensitive, and reproducible substrates for future SERS-based biosensors. © 2018 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acsomega.8b00023

✓ نام ژورنال:

ACS Omega

✓ سال انتشار:

2018

✓ کلیدواژه‌ها:

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Synergistic enhancement via plasmonic nanoplate-bacteria-nanorod supercrystals for highly efficient SERS sensing of food-borne bacteria

✓ نویسندگان:

Wang W., Hynninen V., Qiu L., Zhang A., Lemma T., Zhang N., Ge H., Toppari J.J., Hytönen V.P., Wang J.

✓ خلاصه پژوهش:

Bio-sensing techniques utilizing metallic nanoparticles as a probe have gained more and more attention and play today an important role in the detection of bacteria. To date, although several sensing materials have been tested, there is still a long way to go to achieve a fast, low-cost, ultrasensitive and multifunctional substrate suitable for a universal biosensor for detection of bacterial cells. Here, we report a novel probe design based on anisotropic plasmonic nanoparticles organized to a biocompatible 3D bio-inorganic scaffold, i.e., nanoplate-bacteria-nanorod supercrystals (NBNS) with extremely high surface-enhanced Raman spectroscopic (SERS) activity as a model of synergistic plasmonic enhancement from nanoparticles and assembly. This unique structure of nanoparticles incorporated into supercrystal assembly allows efficient detection, identification and classification of cells and bacteria. In this design, the NBNS ensures that the target cells take advantage of the superior multifold increase in Raman scattering signals (electromagnetic enhancement from both types of nanoparticles), due to the geometry of the 3D scaffold. The excellent reproducibility and stability of NBNS substrates were confirmed by comparing the SERS activities of different substrates and analytes. Principal component analysis (PCA) applied to the SERS spectra clearly discriminated the homogeneous bacterial samples and their mixtures. Successful detection and identification of bacteria in model samples consisting of two representative bacteria blends in Fanta soft-drink were demonstrated via plasmonic bio-inorganic scaffold combined with PCA analysis. We believe that this work will greatly facilitate the development of ultrasensitive SERS probes for highly advanced biosensor, pioneering the use of SERS for controlling food safety. © 2016 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.snb.2016.08.040

✓ نام ژورنال:

Sensors and Actuators, B: Chemical

✓ سال انتشار:

2017

✓ کلیدواژه‌ها:

Assembly; Asymmetric nanoparticles; Bacteria; Chemometrics; SERS

✓ عنوان پژوهش:

A novel surface-enhanced Raman scattering (SERS) strategy for ultrasensitive detection of bacteria based on three-dimensional (3D) DNA walker

✓ نویسندگان:

Yang E., Li D., Yin P., Xie Q., Li Y., Lin Q., Duan Y.

✓ خلاصه پژوهش:

Bacteria seriously endanger human life and health, and the detection of bacteria is vital for the prevention and treatment of related diseases. Surface-enhanced Raman scattering (SERS) is considered as a powerful technique for bacterial detection due to the inherent richness of spectral data. In this work, a novel SERS strategy based on three-dimensional (3D) DNA walker was developed for quantitative analysis of Salmonella typhimurium (S. ty). The complimentary DNA of S.ty-recognizing aptamer (cApt) was replaced from the double-stranded DNA (dsDNA) of Apt@cApt in the presence of S.ty, which can trigger the endonuclease mediated “DNA walker” on the surface of gold modified magnetic nanoparticles (AuMNPs). The DNA residues on the surface of AuMNPs can bind to SERS tag through base complementary pairing, and the complex of “AuMNPs@SERS tag” can be separated from the fluid by an external magnetic field for SERS analysis. It was found that the SERS intensity showed a good linear relationship with both lower (10–104 CFU/mL) and higher (104–106 CFU/mL) S.ty concentration. A superior limit of detection (LOD) as low as 4 CFU/mL was achieved due to the signal amplification effect of “DNA walker”, and the preeminent selectivity of the proposed method was determined by the selectivity of the aptamer sequence. This strategy of separating the SERS tag from the biological matrix enables high stability and good repeatability of the SERS spectra, which presents a new method for SERS detection of biomaterials that can benefit various application scenarios. © 2020 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.bios.2020.112758

✓ نام ژورنال:

Biosensors and Bioelectronics

✓ سال انتشار:

2021

✓ کلیدواژه‌ها:

Bacteria detection; Bimetallic SERS tag; DNA walker; Surface-enhanced Raman spectroscopy

✓ عنوان پژوهش:

Rapid concentration detection and differentiation of bacteria in skimmed milk using surface enhanced Raman scattering mapping on 4-mercaptophenylboronic acid functionalized silver dendrites

✓ نویسندگان:

Wang P., Pang S., Pearson B., Chujo Y., McLandsborough L., Fan M., He L.

✓ خلاصه پژوهش:

A novel method was developed to rapidly concentrate, detect, and differentiate bacteria in skimmed milk using surface enhanced Raman scattering (SERS) mapping on 4-mercaptophenylboronic acid (4-MPBA) functionalized silver (Ag) dendrites. The 4-MPBA functionalized Ag dendritic SERS substrate was used to capture the bacterial cells and enhance the bacterial signal. Salmonella, a significantly important food pathogen, was used as the representative strain to optimize and evaluate the developed method. The capture efficiency for Salmonella enterica subsp enterica BAA1045 (SE1045) was 84.92 ± 3.25% at 106 CFU/mL and as high as 99.65 ± 3.58% at 103 CFU/mL. Four different strains, two gram-negative and two gram-positive, can be clearly distinguished by their SERS spectra using principle component analysis. A mapping technique was utilized to automatically collect 400 spectra over an area of 60 μm × 60 μm to construct a visual image for a sensitive and statistically reliable detection within 30 min. Using this method, we were able to detect as low as 103 CFU/mL bacterial cells in 50 mM NH4HCO3 solution and 102 CFU/mL cells in both 1% casein and skimmed milk. Our results demonstrate the feasibility of using SERS mapping method coupled with 4-MPBA functionalized Ag dendrites for rapid and sensitive bacteria detection in complex liquid samples. [Figure not available: see fulltext.] © 2017, Springer-Verlag Berlin Heidelberg.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1007/s00216-016-0167-8

✓ نام ژورنال:

Analytical and Bioanalytical Chemistry

✓ سال انتشار:

2017

✓ کلیدواژه‌ها:

4-Mercaptophenylboronic acid; Bacteria; Salmonella; SERS mapping; Silver dendrites

✓ **عنوان پژوهش:**

Spatial mapping of pyocyanin in pseudomonas aeruginosa bacterial communities using surface enhanced raman scattering

✓ **نویسندگان:**

Polisetti S., Baig N.F., Morales-Soto N., Shrout J.D., Bohn P.W.

✓ **خلاصه پژوهش:**

Surface enhanced Raman spectroscopy (SERS) imaging was used in conjunction with principal component analysis (PCA) for the in situ spatiotemporal mapping of the virulence factor pyocyanin in communities of the pathogenic bacterium Pseudomonas aeruginosa. The combination of SERS imaging and PCA analysis provides a robust method for the characterization of heterogeneous biological systems while circumventing issues associated with interference from sample autofluorescence and low reproducibility of SERS signals. The production of pyocyanin is found to depend both on the growth carbon source and on the specific strain of P. aeruginosa studied. A cystic fibrosis lung isolate strain of P. aeruginosa synthesizes and secretes pyocyanin when grown with glucose and glutamate, while the laboratory strain exhibits detectable production of pyocyanin only when grown with glutamate as the source of carbon. Pyocyanin production in the laboratory strain grown with glucose was below the limit of detection of SERS. In addition, the combination of SERS imaging and PCA can elucidate subtle differences in the molecular composition of biofilms. PCA loading plots from the clinical isolate exhibit features corresponding to vibrational bands of carbohydrates, which represent the mucoid biofilm matrix specific to that isolate, features that are not seen in the PCA loading plots of the laboratory strain. © The Author(s), 2016.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1177/0003702816654167

✓ **نام ژورنال:**

Applied Spectroscopy

✓ **سال انتشار:**

2017

✓ **کلیدواژه‌ها:**

Biofilms; PCA; Principal component analysis; Pseudomonas aeruginosa; Pyocyanin; SERS; Surface enhanced Raman spectroscopy

✓ **عنوان پژوهش:**

Core-Shell Nanorod Columnar Array Combined with Gold Nanoplate-Nanosphere Assemblies Enable Powerful in Situ SERS Detection of Bacteria

✓ **نویسندگان:**

Qiu L., Wang W., Zhang A., Zhang N., Lemma T., Ge H., Toppari J.J., Hytönen V.P., Wang J.

✓ **خلاصه پژوهش:**

Development of a label-free ultrasensitive nanosensor for detection of bacteria is presented. Sensitive assay for Gram-positive bacteria was achieved via electrostatic attraction-guided plasmonic bifacial superstructure/bacteria/columnar array assembled in one step. Dynamic optical hotspots were formed in the hybridized nanoassembly under wet-dry critical state amplifying efficiently the weak vibrational modes of three representative food-borne Gram-positive bacteria, that is, Staphylococcus xylosus, Listeria monocytogenes, and Enterococcus faecium. These three bacteria with highly analogous Raman spectra can be effectively differentiated through droplet wet-dry critical SERS approach combined with 3D PCA statistical analysis so that highly sensitive discrimination of bacterial species and samples containing mixtures of bacteria can be achieved. © 2016 American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acsami.6b06674

✓ **نام ژورنال:**

ACS Applied Materials and Interfaces

✓ **سال انتشار:**

2016

✓ **کلیدواژه‌ها:**

3D PCA; Gram-positive bacteria; nanoarray; SERS; superstructure

✓ **عنوان پژوهش:**

M13 bacteriophage as materials for amplified surface enhanced raman scattering protein sensing

✓ **نویسندگان:**

Lee J.H., Xu P.F., Domaille D.W., Choi C., Jin S., Cha J.N.

✓ **خلاصه پژوهش:**

Because of their unique properties, nanomaterials have been actively investigated in recent years for biosensing applications. A typical approach for biomarker detection is to attach capture or detection antibodies to nanomaterials, allow the analyte to bind, and measure the resulting change in signal. While antibodies or aptamers possess at most one binding site each for the nanomaterial and analyte, it is shown that the high surface area filamentous M13 bacteriophage can be utilized as a scaffold for generating an amplified signal. Since only a few proteins at the tip of the micrometer-long virus are involved in antigen binding, the rest of the bacteriophage can be augmented with hundreds of functional groups, each of which can bind to a specific nanomaterial. It is demonstrated that the combination of DNA-modified M13 bacteriophage and surface enhanced Raman spectroscopy (SERS) active nanoparticles can be used to produce exponential gains in Raman signal compared to that of antibodies at the same antigen concentration. Because of these high sensitivities, Raman measurements can be made directly from individual silica microparticles, potentially enabling future single step identification and analysis of different proteins in complex mixtures, while avoiding additional processing steps or prepatterned microarrays. © 2013 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/adfm.201303331

✓ **نام ژورنال:**

Advanced Functional Materials

✓ **سال انتشار:**

2014

✓ **کلیدواژه‌ها:**

core-shell nanoparticles; DNA; M13 bacteriophage; protein sensors; SERS

✓ **عنوان پژوهش:**

Surface-enhanced raman scattering of bacterial cell culture growth media

✓ **نویسندگان:**

Marotta N.E., Bottomley L.A.

✓ **خلاصه پژوهش:**

The application of surface-enhanced Raman spectroscopy (SERS) to characterizing bacteria is an active area of investigation. Micro- and nano-structured SERS substrates have enabled detection of pathogens present in biofluids. Several publications have focused on determining the spectral bands characteristic of bacteria from different species and cell lines. In this report, the spectra of fifteen commonly used bacterial growth media are presented. In many instances, these spectra are similar to published spectra purportedly characteristic of specific bacterial species. The findings presented herein suggest that bacterial fingerprinting by SERS requires further examination. © 2010 Society for Applied Spectroscopy.

✓ **لینک** DOI **(استفاده برای دانلود مقاله)**

10.1366/000370210791414326

✓ **نام ژورنال:**

Applied Spectroscopy

✓ **سال انتشار:**

2010

✓ **کلیدواژه‌ها:**

Bacterial identification; Growth media; Nanostructured silver surface; SERS; Surface-enhanced raman scattering; Surface-enhanced raman spectroscopy

✓ **عنوان پژوهش:**

Bio-hybrid gold nanoparticles as SERS probe for rapid bacteria cell identification

✓ **نویسندگان:**

Franco D., De Plano L.M., Rizzo M.G., Scibilia S., Lentini G., Fazio E., Neri F., Guglielmino S.P.P., Mezzasalma A.M.

✓ **خلاصه پژوهش:**

This study reports the utilization of engineered molecular networks between bacteriophage (or phage) and gold nanoparticles (AuNPs) prepared ablating a high purity gold target in water by nanosecond laser source. Gold colloids are assembled with P9b phage clone, displaying the specific peptide (QRKLAAKLT), able to bind P. aeruginosa. The single components and assembled systems were characterized by spectroscopic and electronic techniques, such as the conventional optical absorption and micro-Raman spectroscopies as well as the Dynamic Light Scattering (DLS) and Scanning Transmission Electron Microscopy (STEM) techniques. The performance of the AuNPs-phage assembly as substrate for Surface-Enhanced Raman Spectroscopy (SERS) was tested against the detection of the characteristics Raman vibrational features of the Pseudomonas aeruginosa bacteria. © 2019 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.saa.2019.117394

✓ **نام ژورنال:**

Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

Gold nanoparticles; Phage-display; Phage/AuNPs networks; Pseudomonas aeruginosa; Surface Enhanced Raman Spectroscopy

✓ **عنوان پژوهش:**

Rapid detection of listeria by bacteriophage amplification and SERS-lateral flow immunochromatography

✓ **نویسندگان:**

Stambach N.R., Carr S.A., Cox C.R., Voorhees K.J.

✓ **خلاصه پژوهش:**

A rapid Listeria detection method was developed utilizing A511 bacteriophage mplification combined with surface-enhanced Raman spectroscopy (SERS) and lateral flow mmunochromatography (LFI). Anti-A511 antibodies were covalently linked to SERS nanoparticles nd printed onto nitrocellulose membranes. Antibody-conjugated SERS nanoparticles were used as uantifiable reporters. In the presence of A511, phage-SERS nanoparticle complexes were arrested nd concentrated as a visible test line, which was interrogated quantitatively by Raman spectroscopy. n increase in SERS intensity correlated to an increase in captured phage-reporter complexes. SERS imit of detection was 6 × 106 pfu·mL-1, offering detection below that obtainable by the naked eye (LOD 6 × 107 pfu·mL-1). Phage amplification experiments were carried out at a multiplicity of infection (MOI) of 0.1 with 4 different starting phage concentrations monitored over time using SERS-LFI and validated by spot titer assay. Detection of L. monocytogenes concentrations of 1 × 107 colony forming units (cfu)×mL-1, 5 × 106 cfu·mL-1, 5 × 105 cfu·mL-1 and 5 × 104 cfu·mL-1 was achieved in 2, 2, 6, and 8 h, respectively. Similar experiments were conducted at a constant starting phage concentration (5 × 105 pfu·mL-1) with MOIs of 1, 2.5, and 5 and were detected in 2, 4, and 5 h, respectively. © 2015 by the authors; licensee MDPI, Basel, Switzerland.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.3390/v7122962

✓ **نام ژورنال:**

Viruses

✓ **سال انتشار:**

2015

✓ **کلیدواژه‌ها:**

A511; Lateral flow immunochromatography; Listeria monocytogenes; Phage amplification; Surface-enhanced raman pectroscopy

✓ **عنوان پژوهش:**

Fiber-Optic SERS Probes Fabricated Using Two-Photon Polymerization For Rapid Detection of Bacteria

✓ **نویسندگان:**

Kim J.A., Wales D.J., Thompson A.J., Yang G.-Z.

✓ **خلاصه پژوهش:**

This study presents a novel fiber-optic surface-enhanced Raman spectroscopy (SERS) probe (SERS-on-a-tip) fabricated using a simple, two-step protocol based on off-the-shelf components and materials, with a high degree of controllability and repeatability. Two-photon polymerization and subsequent metallization are adopted to fabricate a range of SERS arrays on both planar substrates and end-facets of optical fibers. For the SERS-on-a-tip probes, a limit of detection of 10−7 m (Rhodamine 6G) and analytical enhancement factors of up to 1300 are obtained by optimizing the design, geometry, and alignment of the SERS arrays on the tip of the optical fiber. Furthermore, strong repeatability and consistency are achieved for the fabricated SERS arrays, demonstrating that the technique may be suitable for large-scale fabrication procedures in the future. Finally, rapid SERS detection of live Escherichia coli cells is demonstrated using integration times in the milliseconds to seconds range. This result indicates strong potential for in vivo diagnostic use, particularly for detection of infections. Moreover, to the best of our knowledge, this represents the first report of detection of live, unlabeled bacteria using a fiber-optic SERS probe. © 2020 The Authors. Published by WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/adom.201901934

✓ **نام ژورنال:**

Advanced Optical Materials

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

bacteria detection; optical fibers; Raman spectroscopy; SERS; two-photon polymerization

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Magnetic plasmonic particles for SERS-based bacteria sensing: A review

✓ **نویسندگان:**

Wang C., Meloni M.M., Wu X., Zhuo M., He T., Wang J., Wang C., Dong P.

✓ **خلاصه پژوهش:**

This review describes recent advances in the use of magnetic-plasmonic particles (MPPs) for bacteria detection by Surface-Enhanced Raman Scattering (SERS). Pathogenic bacteria pollution has always been a major threat to human health and safety. SERS spectroscopy has emerged as a powerful and promising technique for sensitive and selective detection of pathogen bacteria. MPPs are considered as a versatile SERS platform for their excellent plasmonic properties and good magnetic responsiveness. Improved preparation method and typical characterization technique of MPPs are introduced, focusing on the thin and continuous metallic shell covering process. Consequently, the SERS-based sensing methods for bacteria identification were discussed, including the label-free and label-based methods. Finally, an overview of the current state of the field and our perspective on future development directions are given. © 2019 Author(s).

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1063/1.5050858

✓ **نام ژورنال:**

AIP Advances

✓ **سال انتشار:**

2019

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Octupolar metastructures for a highly sensitive, rapid, and reproducible phage-based detection of bacterial pathogens by surface-enhanced Raman scattering

✓ نویسندگان:

Rippa M., Castagna R., Pannico M., Musto P., Borriello G., Paradiso R., Galiero G., Censi S.B., Zhou J., Zyss J., Petti L.

✓ خلاصه پژوهش:

The development of fast and ultrasensitive methods to detect bacterial pathogens at low concentrations is of high relevance for human and animal health care and diagnostics. In this context, surface-enhanced Raman scattering (SERS) offers the promise of a simplified, rapid, and high-sensitive detection of biomolecular interactions with several advantages over previous assay methodologies. In this work, we have conceived reproducible SERS nanosensors based on tailored multilayer octupolar nanostructures which can combine high enhancement factor and remarkable molecular selectivity. We show that coating novel multilayer octupolar metastructures with proper self-assembled monolayer (SAM) and immobilized phages can provide label-free analysis of pathogenic bacteria via SERS leading to a giant increase in SERS enhancement. The strong relative intensity changes of about 2100% at the maximum scattered SERS wavelength, induced by the Brucella bacterium captured, demonstrate the performance advantages of the bacteriophage sensing scheme. We performed measurements at the single-cell level thus allowing fast identification in less than an hour without any demanding sample preparation process. Our results based on designing wellcontrolled octupolar coupling platforms open up new opportunities toward the use of bacteriophages as recognition elements for the creation of SERS-based multifunctional biochips for rapid culture and label-free detection of bacteria. © 2017 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acssensors.7b00195

✓ نام ژورنال:

ACS Sensors

✓ سال انتشار:

2017

✓ کلیدواژه‌ها:

Agro-food; Localized surface plasmon resonance; Metastructures; Pathogen bacteria detection; Surface enhanced raman scattering

✓ **عنوان پژوهش:**

Stability of Isolated Bacterial and Photosystem II Reaction Center Complexes on Ag Electrode Surfaces. A Surface-Enhanced Resonance Raman Study

✓ **نویسندگان:**

Picorel R., Holt R.E., Heald R., Cotton T.M., Seibert M., Holt R.E., Cotton T.M., Heald R., Seibert M.

✓ **خلاصه پژوهش:**

Surface-enhanced resonance Raman scattering (SERRS) spectra from isolated Rhodospirillum rubrum bacterial reaction center complexes indicate that the carotenoid, spirilloxanthin, resides in the cis conformation, while SERRS spectra from isolated photosystem II (PSII) D1-D2-cytochrome b-559 reaction center complexes show that β-carotene is in the all-trans conformation. The fact that the cis conformation of the native bacterial reaction center carotenoid is maintained during SERRS experiments suggests that significant denaturation of the protein matrix does not occur as a result of contact with the anodized Ag metallic surface required for observation of SERRS spectra. Although a similar conclusion cannot be drawn from observations of β-carotene in PSII reaction centers, no new spectral bands previously ascribed to denatured cytochrome (Cyt) heme groups are observed with Cyt 6-559 during SERRS experiments. Specific enhancement of SERRS signals from Cyt b-559 compared to the other chromophores of the PSII reaction center and in particular observation of a strong 1360-cm−1 band indicate that the heme group is located on or very close to the surface of the PSII reaction center complex and can be reduced by the Ag electrode. © 1991, American Chemical Society. All rights reserved.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/ja00008a006

✓ **نام ژورنال:**

Journal of the American Chemical Society

✓ **سال انتشار:**

1991

✓ **کلیدواژه‌ها:**

✓ **عنوان پژوهش:**

Fast discrimination of bacteria using a filter paper–based SERS platform and PLS-DA with uncertainty estimation

✓ **نویسندگان:**

Villa J.E.L., Quiñones N.R., Fantinatti-Garboggini F., Poppi R.J.

✓ **خلاصه پژوهش:**

Rapid and reliable identification of bacteria is an important issue in food, medical, forensic, and environmental sciences; however, conventional procedures are time-consuming and often require extensive financial and human resources. Herein, we present a label-free method for bacterial discrimination using surface-enhanced Raman spectroscopy (SERS) and partial least squares discriminant analysis (PLS-DA). Filter paper decorated with gold nanoparticles was fabricated by the dip-coating method and it was utilized as a flexible and highly efficient SERS substrate. Suspensions of bacterial samples from three genera and six species were directly deposited on the filter paper–based SERS substrates before measurements. PLS-DA was successfully employed as a multivariate supervised model to classify and identify bacteria with efficiency, sensitivity, and specificity rates of 100% for all test samples. Variable importance in projection was associated with the presence/absence of some purine metabolites, whereas confidence intervals for each sample in the PLS-DA model were calculated using a resampling bootstrap procedure. Additionally, a potential new species of bacteria was analyzed by the proposed method and the result was in agreement with that obtained via 16S rRNA gene sequence analysis, thereby indicating that the SERS/PLS-DA approach has the potential to be a valuable tool for the discovery of novel bacteria. [Figure not available: see fulltext.] © 2018, Springer-Verlag GmbH Germany, part of Springer Nature.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1007/s00216-018-1485-9

✓ **نام ژورنال:**

Analytical and Bioanalytical Chemistry

✓ **سال انتشار:**

2019

✓ **کلیدواژه‌ها:**

16S rRNA gene sequence analysis; Chemometrics, partial least squares discriminant analysis; Gold nanoparticles; Reliability estimation; Surface-enhanced Raman spectroscopy

✓ **عنوان پژوهش:**

Surface-Enhanced Raman Spectroscopy for the Detection of a Metabolic Product in the Headspace Above Live Bacterial Cultures

✓ **نویسندگان:**

Kelly J., Patrick R., Patrick S., Bell S.E.J.

✓ **خلاصه پژوهش:**

In situ surface-enhanced Raman spectra of the headspace above cultures of six bacterial species showed strong characteristic bands from chemisorbed methyl sulfide. This marker compound is created by dissociation of dimethyl disulfide (DMDS), a fermentative metabolite of bacteria, on the surface of the enhancing Au or Ag nanoparticle films. Kinetic binding plots of media spiked with DMDS and of live cultures showed that the Au-based substrates were more suitable for the rapid detection of bacteria than Ag-based substrates. For E. coli DH5α, the sensitivity limit for headspace SERS detection was 1.5×107 CFU mL−1, which corresponded to detection 15 min after inoculation of the growth medium. Since the metabolites are only produced by viable bacteria, antibiotic (gentamicin) treatment stopped the normal signal growth of the marker peak. This work is a promising step towards rapid bedside detection of bacterial infections and rapid screening of antibiotics against bacteria. © 2018 Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1002/anie.201808185

✓ **نام ژورنال:**

Angewandte Chemie - International Edition

✓ **سال انتشار:**

2018

✓ **کلیدواژه‌ها:**

antibiotics; bacteria; headspace; nanotechnology; SERS

✓ **عنوان پژوهش:**

Strain-level typing and identification of bacteria – a novel approach for SERS active plasmonic nanostructures

✓ **نویسندگان:**

Witkowska E., Korsak D., Kowalska A., Janeczek A., Kamińska A.

✓ **خلاصه پژوهش:**

One of the potential applications of surface-enhanced Raman spectroscopy (SERS) is the detection of biological compounds and microorganisms. Here we demonstrate that SERS coupled with principal component analysis (PCA) serves as a perfect method for determining the taxonomic affiliation of bacteria at the strain level. We demonstrate for the first time that it is possible to distinguish different genoserogroups within a single species, Listeria monocytogenes, which is one of the most virulent foodborne pathogens and in some cases contact with which may be fatal. We also postulate that it is possible to detect additional proteins in the L. monocytogenes cell envelope, which provide resistance to benzalkonium chloride and cadmium. A better understanding of this infectious agent could help in selecting the appropriate pharmaceutical product for enhanced treatment. © 2018, The Author(s).

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1007/s00216-018-1153-0

✓ **نام ژورنال:**

Analytical and Bioanalytical Chemistry

✓ **سال انتشار:**

2018

✓ **کلیدواژه‌ها:**

Bacteria detection; Bacteria identification; bcrABC; BcrB; BcrC; CadA1; CadA2; Listeria monocytogenes; PCA; SERS; Strain level discrimination

✓ **عنوان پژوهش:**

Innovative sandwich assay with dual optical and SERS sensing mechanisms for bacterial detection

✓ **نویسندگان:**

Pearson B., Wang P., Mills A., Pang S., McLandsborough L., He L.

✓ **خلاصه پژوهش:**

The increased incidence of food pathogen outbreaks placed a new emphasis on the requirement of a rapid, sensitive, and reliable detection method for pathogens in food samples. Surface-enhanced Raman spectroscopy (SERS) is a technique that tremendously enhances the weak Raman scattering of an analyte by using a metallic nano-substrate. Herein, we developed an innovative SERS sandwich assay which is based on 3-mercaptophenylboronic acid (3-MPBA) as a capturer and reporter for the detection of bacteria. Using Salmonella enterica and Listeria monocytogenes as model bacteria, we have identified a unique bacterial SERS signal upon the interaction between the captured bacteria, 3-MBPA and silver nanoparticles (AgNPs), which was used as the base for reliable detection of bacteria using SERS mapping. Both optical and chemical (SERS mapping) imaging were used as mechanisms for bacterial detection and quantification. Our assay achieved sensitive and reliable detection of as low as 102 CFU mL-1 for Salmonella with great capability for quantification. The total analytical time for optical detection is 1.25 hours and for SERS imaging is 3 hours. Our assay represents an innovative platform for rapid, sensitive and reliable detection of total bacteria for an array of industrial applications. © The Royal Society of Chemistry.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/c7ay01596h

✓ **نام ژورنال:**

Analytical Methods

✓ **سال انتشار:**

2017

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Identification and quantitation of pathogenic bacteria via in-situ formation of silver nanoparticles on cell walls, and their detection via SERS

✓ نویسندگان:

Alula M.T., Krishnan S., Hendricks N.R., Karamchand L., Blackburn J.M.

✓ خلاصه پژوهش:

The authors present a fast and sensitive surface-enhanced Raman spectroscopy (SERS) method for the determination of Mycobacterium smegmatis. It is based on the formation of silver nanoparticles (AgNPs) directly on the surface of bacteria via the silver mirror reaction. To achieve this, the bacteria are mixed with silver nitrate, treated with NaOH, and then with ammonium hydroxide until all silver oxide precipitate is completely dissolved. Treatment of the reaction mixture with glucose at 55 °C results in the formation of AgNPs on the surface of the bacteria. The detection of M. smegmatis by SERS is simple and straightforward in that 4 μL of a suspension of Ag-coated M. smegmatis are pipetted onto a polypropylene surface and SERS spectra are acquired. Quantitative evaluation is done best by using the distinct vibrational band at 731 cm−1. Routine detection and identification of M. smegmatis thereafter required ~1000 bacilli per laser spot area and a limit of detection below 100 bacilli, using a cheap, dispersive Raman spectrometer. Our method was also applied to detect M. bovis BCG, M. tuberculosis, Staphylococcus aureus, S. epidermis, Bacillus cereus and two laboratory strains of Escherichia coli, thus demonstrating the wider applicability of this approach. [Figure not available: see fulltext.] © 2016, Springer-Verlag Wien.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1007/s00604-016-2013-2

✓ نام ژورنال:

Microchimica Acta

✓ سال انتشار:

2017

✓ کلیدواژه‌ها:

Mycobacterium smegmatis; Mycobacterium tuberculosis; Polypropylene; Raman spectroscopy; Silver mirror reaction

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Silver nanoparticle/bacterial nanocellulose paper composites for paste-and-read SERS detection of pesticides on fruit surfaces

✓ **نویسندگان:**

Parnsubsakul A., Ngoensawat U., Wutikhun T., Sukmanee T., Sapcharoenkun C., Pienpinijtham P., Ekgasit S.

✓ **خلاصه پژوهش:**

This study aimed to develop an eco-friendly flexible surface-enhanced Raman scattering (SERS) substrate for in-situ detection of pesticides using biodegradable bacterial nanocellulose (BNC). Plasmonic silver nanoparticle- bacterial nanocellulose paper (AgNP-BNCP) composites were prepared by vacuum-assisted filtration. After loading AgNPs into BNC hydrogel, AgNPs were trapped firmly in the network of nanofibrous BNCP upon ambient drying process, resulting in 3D SERS hotspots within a few-micron depth on the substrate. The fabricated AgNP-BNCPs exhibited high SERS activity with good reproducibility and stability as demonstrated by the detection of 4-aminothiophenol and methomyl pesticide. Due to the optical transparency of BNCP, a direct and rapid detection of methomyl on fruit peels using AgNP-BNCPs can be achieved, demonstrating a simple and effective 'paste-and-read' SERS approach. These results demonstrate potential of AgNP-BNCP composites for user-friendly in-situ SERS analysis. © 2020 Elsevier Ltd

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1016/j.carbpol.2020.115956

✓ **نام ژورنال:**

Carbohydrate Polymers

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

Bacterial nanocellulose; Flexible substrate; In situ detection; Methomyl; Silver nanoparticles; Surface enhanced Raman scattering

✓ **عنوان پژوهش:**

Black phosphorus-Au filter paper-based three-dimensional SERS substrate for rapid detection of foodborne bacteria

✓ **نویسندگان:**

Huang D., Zhuang Z., Wang Z., Li S., Zhong H., Liu Z., Guo Z., Zhang W.

✓ **خلاصه پژوهش:**

Rapid and accurate detection of foodborne bacteria is believed to be of vital importance in assuring food safety. In this work, we explored a novel label-free three-dimensional surface-enhanced Raman scattering (3D-SERS) substrate based on black phosphorus-Au (BP-Au) filter paper for the detection and discrimination of three common foodborne bacteria including Staphylococcus aureus, Listeria monocytogenes and Escherichia coli without complicated sample processing. It was found that the BP-Au filter paper-based 3D-SERS substrate could offer larger surface area as well as more “hotspots” than 2D-SERS substrate for sample detection. Moreover, our results showed that this 3D substrate could efficiently enhance Raman signals from model molecules and exhibit satisfactory SERS activity allowing for specific recognition and discrimination of three types of target bacteria at a concentration of 107 CFU/mL. Subsequently, SERS spectral data from three bacteria were successfully distinguished by principle component analysis (PCA) and linear discriminant analysis (LDA). These results demonstrated that the novel 3D SERS substrate with facile, low-cost, green fabrication process as well as high sensitivity could serve as an excellent alternative to conventional substrates for rapid label-free detection and identification of foodborne bacteria with the aid of statistical discriminant analysis PCA-LDA in food safety application. © 2019 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.apsusc.2019.143825

✓ **نام ژورنال:**

Applied Surface Science

✓ **سال انتشار:**

2019

✓ **کلیدواژه‌ها:**

BP-Au nanoparticles; Filter paper-based SERS substrate; Foodborne bacteria detection; Surface-enhanced Raman scattering

✓ **عنوان پژوهش:**

Chemically imaging bacteria with super-resolution SERS on ultra-thin silver substrates

✓ **نویسندگان:**

Olson A.P., Spies K.B., Browning A.C., Soneral P.A.G., Lindquist N.C.

✓ **خلاصه پژوهش:**

Plasmonic hotspots generate a blinking Surface Enhanced Raman Spectroscopy (SERS) effect that can be processed using Stochastic Optical Reconstruction Microscopy (STORM) algorithms for super-resolved imaging. Furthermore, by imaging through a diffraction grating, STORM algorithms can be modified to extract a full SERS spectrum, thereby capturing spectral as well as spatial content simultaneously. Here we demonstrate SERS and STORM combined in this way for super-resolved chemical imaging using an ultra-thin silver substrate. Images of gram-positive and gram-negative bacteria taken with this technique show excellent agreement with scanning electron microscope images, high spatial resolution at <50 nm, and spectral SERS content that can be correlated to different regions. This may be used to identify unique chemical signatures of various cells. Finally, because we image through as-deposited, ultra-thin silver films, this technique requires no nanofabrication beyond a single deposition and looks at the cell samples from below. This allows direct imaging of the cell/substrate interface of thick specimens or imaging samples in turbid or opaque liquids since the optical path doesn't pass through the sample. These results show promise that super-resolution chemical imaging may be used to differentiate chemical signatures from cells and could be applied to other biological structures of interest. © 2017 The Author(s).

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1038/s41598-017-08915-w

✓ **نام ژورنال:**

Scientific Reports

✓ **سال انتشار:**

2017

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Rapid detection of the bacterial biomarker pyocyanin in artificial sputum using a SERS-active silicon nanowire matrix covered by bimetallic noble metal nanoparticles

✓ نویسندگان:

Žukovskaja O., Agafilushkina S., Sivakov V., Weber K., Cialla-May D., Osminkina L., Popp J.

✓ خلاصه پژوهش:

Early stage detection of Pseudomonas infections is life-saving, especially in the case of patients with cystic fibrosis. Pyocyanin (PYO) is a specific metabolite of the Pseudomonas aeruginosa bacteria, and detection of it directly in the sputum can significantly reduce the diagnosis time of the infection. In the present study, aiming to achieve this goal, a simple and cost-effective surface-enhanced Raman spectroscopy (SERS) detection platform was proposed. For this, a silicon nanowire (SiNW) matrix, produced by metal-assisted chemical etching of silicon substrates was variously modified by noble metal (silver and gold) nanoparticles (NPs) and tested for the detection of the metabolite PYO in the complex matrix of artificial sputum. We found the SERS substrate with Ag NPs on the bottom of SiNWs and deposited bimetallic Ag/Au NPs on the top of them the best suited for the sensitive detection of PYO. The investigated plasmonic substrate showed good point-to-point and batch-to-batch signal reproducibility and allowed for the detection of PYO in artificial sputum down to 6.25 μM, which is the required sensitivity for clinical applications. © 2019

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.talanta.2019.04.047

✓ نام ژورنال:

Talanta

✓ سال انتشار:

2019

✓ کلیدواژه‌ها:

Metabolite; Pseudomonas aeruginosa; Pyocyanin; Silicon nanowires (SiNWs); Sputum; Surface enhanced Raman spectroscopy (SERS)

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Rationalizing the SER spectra of bacteria

✓ **نویسندگان:**

Smith-Palmer T., Douglas C., Fredericks P.

✓ **خلاصه پژوهش:**

The SER spectra of riboflavin and FAD are identical and are resonance enhanced at 514 or 532 nm. Signals from FAD/riboflavin dominated SER spectra whenever these compounds were present with proteins or bacteria. SER spectra of very different bacteria such as Pseudomonas aeruginosa, Bacillus subtilis and Geobacillus stearothermophilus were dominated by signals from FAD, even when these bacteria were added to a preformed colloid. The SERS signal of FAD is greatly reduced at 785 nm, and SER spectra of bacteria excited at 785 nm are quite different than those collected at 514 or 532 nm. This supports the assignment of the peaks in the 514 nm SER spectra of bacteria to FAD rather to amino acids or N-acetylglucosamine. The SER spectra of certain mixes of adenine and FAD showed similar changes to those of bacteria when the excitation was changed from 514/532 to 785 nm. The ratios of colloid: bacteria were of critical important for obtaining good SER spectra, and the addition of sodium sulfate was also beneficial. Removal of EPS from bacteria before analysis facilitated interaction with the silver surface, and may be a useful step to include in identification protocols. © 2010 Elsevier B.V. All rights reserved.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.vibspec.2010.02.012

✓ **نام ژورنال:**

Vibrational Spectroscopy

✓ **سال انتشار:**

2010

✓ **کلیدواژه‌ها:**

Bacteria; FAD; SERS; Silver colloid

✓ عنوان پژوهش:

The chromophore-binding site of bacteriorhodopsin. Resonance Raman and surface-enhanced resonance Raman spectroscopy and quantum chemical study

✓ نویسندگان:

Nabiev I.R., Efremóv R.G., Chumanov G.D.

✓ خلاصه پژوهش:

Surface-enhanced Raman spectra of membrane protein, located in native mem brane, bacteriorhodopsin, adsorbed by silver electrodes and hydrosols have been obtained for the first time. The distance between the retinal Schiff's base and the external side of purple membrane of Halobacteriim halobiim was shown to be 6-9 A. The possible distribition of the point charges aroind protonated retinal Schiff's base has been proposed on the basis of the resonance Raman data and quantim chemical CNDO/S-CI calculations. Such a model contains tyrosine residue located near the retinal Schiff's base and connected with COO- groip via hydrogen bond COO- group acts as a protonated Schiff's base counterion. The distance between oxygen atoms of COO- group and retinal Schiff's base plane is 2.5-3.0A. The hydrogen bond (O-H. . .O-) length between oxygen atom of OH-group and oxygen atom of COO- group has been chosen 2.7±0.1Å Tyrosine hydroxyl group is located at 2.8-3.5 A from retinal Schiff's base plane. It was shown that in contrast to generally accepted Honig and Nakanishi model the spectral properties of Brh570, K610, L550 and M4Ï2 forms of bacteriorhodopsin photocycle as well as observed tyrosine deprotonation and COO- group protonation during M412 formation can be explained reasonably well by the suggested charge distribution. Furthermore, such a model of bacteriorhodopsin active site microenvironment allows to explain catalyzing of photo-induced protonated retinal Schiff's base deprotonation observed in our preliminary experiments. © 1985 Indian Academy of Sciences.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1007/BF02703989

✓ نام ژورنال:

Journal of Biosciences

✓ سال انتشار:

1985

✓ کلیدواژه‌ها:

Bacteriorhodopsin; membrane protein; quantum chemical study; Raman effect

✓ **عنوان پژوهش:**

Reproducible, shelf-stable, and bioaffinity SERS nanotags inspired by multivariate polyphenolic chemistry for bacterial identification

✓ **نویسندگان:**

Huang L., Sun D.-W., Wu Z., Pu H., Wei Q.

✓ **خلاصه پژوهش:**

Efficient identification of pathogenic bacteria is greatly concerned with microbial food safety and foodborne diseases diagnosis. Surface-enhanced Raman scattering (SERS) tags are among the cutting-edge tools for bioanalysis, but facing troubles in either SERS sensitivity, durability, interfering signals, or universal recognition agents for target bacteria. This work proposed a multivariate scheme enabled by polyphenolic chemistry for the green synthesis, facile stabilization (functionalization), protective encapsulation, and bio-affinitive design of metal-phenolic networks (MPNs)-encapsulated silver SERS nanotags (AgNPs@4-mercaptobenzonitrile@MPNs). With remarkable SERS properties, shelf stability, and bacterial affinity, AgNPs@4-mercaptobenzonitrile@MPNs tags enabled rapid, reproducible, and interference-free SERS detection of two representative foodborne pathogens (i.e., E. coli O157: H7 and S. aureus) in the assistance of an aptamer-labelled magnetic probe, reaching good sensitivity and selectivity. Moreover, this SERS biosensor worked well in real food samples, manifesting the potential of polyphenolic chemistry in the customization of bio-affinitive SERS nanotags for food safety detection. © 2021 The Author(s)

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.aca.2021.338570

✓ **نام ژورنال:**

Analytica Chimica Acta

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

Foodborne pathogens; Metal-phenolic networks; Microbial food safety; Polyphenols; SERS detection

✓ **عنوان پژوهش:**

Plasmonic and Electrostatic Interactions Enable Uniformly Enhanced Liquid Bacterial Surface-Enhanced Raman Scattering (SERS)

✓ **نویسندگان:**

Tadesse L.F., Ho C.-S., Chen D.-H., Arami H., Banaei N., Gambhir S.S., Jeffrey S.S., Saleh A.A.E., Dionne J.

✓ **خلاصه پژوهش:**

Surface-enhanced Raman spectroscopy (SERS) is a promising cellular identification and drug susceptibility testing platform, provided it can be performed in a controlled liquid environment that maintains cell viability. We investigate bacterial liquid-SERS, studying plasmonic and electrostatic interactions between gold nanorods and bacteria that enable uniformly enhanced SERS. We synthesize five nanorod sizes with longitudinal plasmon resonances ranging from 670 to 860 nm and characterize SERS signatures of Gram-negative Escherichia coli and Serratia marcescens and Gram-positive Staphylococcus aureus and Staphylococcus epidermidis bacteria in water. Varying the concentration of bacteria and nanorods, we achieve large-area SERS enhancement that is independent of nanorod resonance and bacteria type; however, bacteria with higher surface charge density exhibit significantly higher SERS signal. Using cryo-electron microscopy and zeta potential measurements, we show that the higher signal results from attraction between positively charged nanorods and negatively charged bacteria. Our robust liquid-SERS measurements provide a foundation for bacterial identification and drug testing in biological fluids. Copyright © 2020 American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acs.nanolett.0c03189

✓ **نام ژورنال:**

Nano Letters

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

bacteria; cryo-electron microscopy; gold nanorods; infectious disease; surface-enhanced Raman spectroscopy (SERS)

✓ **عنوان پژوهش:**

Surface-enhanced Raman scattering (SERS) imaging of bioactive metabolites in mixed bacterial populations

✓ **نویسندگان:**

De Marchi S., Bodelón G., Vázquez-Iglesias L., Liz-Marzán L.M., Pérez-Juste J., Pastoriza-Santos I.

✓ **خلاصه پژوهش:**

Bacteria frequently live in mixed multispecies communities, shaped by the action of bioactive metabolites that are secreted by the residing microbial species. The identification and tracking of such chemical exchange processes is fundamental toward understanding how these particular extracellular molecules modulate microbial communities and functions. In this context, most chemical imaging approaches so far have focused on the analysis of metabolic interactions occurring between microbial populations co-cultured separately. We demonstrate here the application of surface-enhanced Raman scattering (SERS) spectroscopy as a valuable imaging tool for the non-invasive detection and visualization of metabolites secreted by Escherichia coli and Pseudomonas aeruginosa bacteria, cultured as mixed populations and thereby mimicking the complexity of natural microbial communities. SERS enabled the simultaneous detection and in situ visualization of indole and pyocyanin, revealing the down-regulation of pyocyanin expression due to indole signaling. The successful detection of chemical interactions in mixed bacterial populations shows the potential of SERS for the investigation of the chemistry underpinning multispecies microbial communities. © 2018 Elsevier Ltd

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.apmt.2018.12.005

✓ **نام ژورنال:**

Applied Materials Today

✓ **سال انتشار:**

2019

✓ **کلیدواژه‌ها:**

Indole; Plasmonics; Pyocyanin; Quorum sensing; SERS imaging

✓ **عنوان پژوهش:**

Effect of toxicity of Ag nanoparticles on SERS spectral variance of bacteria

✓ **نویسندگان:**

Cui L., Chen S., Zhang K.

✓ **خلاصه پژوهش:**

Ag nanoparticles (NPs) have been extensively utilized in surface-enhanced Raman scattering (SERS) spectroscopy for bacterial identification. However, Ag NPs are toxic to bacteria. Whether such toxicity can affect SERS features of bacteria and interfere with bacterial identification is still unknown and needed to explore. Here, by carrying out a comparative study on non-toxic Au NPs with that on toxic Ag NPs, we investigated the influence of nanoparticle concentration and incubation time on bacterial SERS spectral variance, both of which were demonstrated to be closely related to the toxicity of Ag NPs. Sensitive spectral alterations were observed on Ag NPs with increase of NPs concentration or incubation time, accompanied with an obvious decrease in number of viable bacteria. In contrast, SERS spectra and viable bacterial number on Au NPs were rather constant under the same conditions. A further analysis on spectral changes demonstrated that it was cell response (i.e. metabolic activity or death) to the toxicity of Ag NPs causing spectral variance. However, biochemical responses to the toxicity of Ag were very different in different bacteria, indicating the complex toxic mechanism of Ag NPs. Ag NPs are toxic to a great variety of organisms, including bacteria, fungi, algae, protozoa etc., therefore, this work will be helpful in guiding the future application of SERS technique in various complex biological systems. © 2014 Elsevier B.V. All rights reserved.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.saa.2014.08.155

✓ **نام ژورنال:**

Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy

✓ **سال انتشار:**

2015

✓ **کلیدواژه‌ها:**

Ag NPs; Bacteria; Surface-enhanced Raman scattering; Toxicity

✓ **عنوان پژوهش:**

Arsenic interception by cell wall of bacteria observed with surface-enhanced Raman scattering

✓ **نویسندگان:**

Tian H., Zhuang G., Ma A., Jing C.

✓ **خلاصه پژوهش:**

The purpose of this study was to determine the interactions between arsenic (As) resistant bacteria and As, using surface-enhanced Raman scattering (SERS) and Fourier transform infrared (FTIR) spectroscopy. According to our 16S rDNA results, eight bacteria isolated from the environment can be identified to four genera (Arthrobacter, Pseudomonas, Sphingomonas, and Acinetobacter). The bacteria were separated into cell wall and protoplast in the study to assess the As(V) attack. The As(V) stress on bacteria could be identified with SERS, but not with FTIR. The bacteria in our study primarily resist As(V) through sequestration of As(V) by the cell wall. The change in SERS peaks and their relationships with cell wall suggested that As(V) mainly interacts with functional groups on the cell wall including polysaccharides and flavin derivates. © 2012 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.mimet.2012.03.018

✓ **نام ژورنال:**

Journal of Microbiological Methods

✓ **سال انتشار:**

2012

✓ **کلیدواژه‌ها:**

Arsenic resistant bacteria; FTIR; SERS

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Structural consequences of the active site substitution Cys181 → Ser in metallo-β-lactamase from Bacteroides fragilis

✓ نویسندگان:

Li Z., Rasmussen B.A., Herzberg O.

✓ خلاصه پژوهش:

The metallo-β-lactamases require divalent cations such as zinc or cadmium for hydrolyzing the amide bond of β-lactam antibiotics. The crystal structure of the Zn2+-bound enzyme from Bacteroides fragilis contains a binuclear zinc center in the active site. A hydroxide, coordinated to both zinc atoms, is proposed as the moiety that mounts the nucleophilic attack on the carbonyl carbon atom of the β-lactam bond of the substrate. It was previously reported that the replacement of the active site Cys181 by a serine residue severely impaired catalysis while atomic absorption measurements indicated that binding of the two zinc ions remained intact. Contradicting data emerge from recent mass spectrometry results, which show that only a single zinc ion binds to the C181S metallo-β-lactamase. In the current study, the C181S mutant enzyme was examined at the atomic level by determining the crystal structure at 2.6 Å resolution. The overall structure of the mutant enzyme is the same as that of the wild-type enzyme. At the mutation site, the side chain of Ser181 occupies the same position as that of the side chain of Cys181 in the wild-type protein. One zinc ion, Zn1, is present in the crystal structure; however, the site of the second zinc ion, Zn2 is unoccupied. A water molecule is associated with Zn1, reminiscent of the hydroxide seen in the structure of the wild-type enzyme but farther from the metal. The position of the water molecule is off the plane of the carboxylate group of Asp103; therefore, the water molecule may be less nucleophilic than a water molecule which is coplanar with the carboxylate group.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1110/ps.8.1.249

✓ نام ژورنال:

Protein Science

✓ سال انتشار:

1999

✓ کلیدواژه‌ها:

Binuclear metal center; Metallo-β-lactamase; Site-directed mutagenesis; X- ray crystallography

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Clustered Regularly Interspaced Short Palindromic Repeats-Mediated Surface-Enhanced Raman Scattering Assay for Multidrug-Resistant Bacteria

✓ **نویسندگان:**

Kim H., Lee S., Seo H.W., Kang B., Moon J., Lee K.G., Yong D., Kang H., Jung J., Lim E.-K., Jeong J., Park H.G., Ryu C.-M., Kang T.

✓ **خلاصه پژوهش:**

Antimicrobial resistance and multidrug resistance are slower-moving pandemics than the fast-spreading coronavirus disease 2019; however, they have potential to cause a much greater threat to global health. Here, we report a clustered regularly interspaced short palindromic repeats (CRISPR)-mediated surface-enhanced Raman scattering (SERS) assay for multidrug-resistant (MDR) bacteria. This assay was developed via a synergistic combination of the specific gene-recognition ability of the CRISPR system, superb sensitivity of SERS, and simple separation property of magnetic nanoparticles. This assay detects three multidrug-resistant (MDR) bacteria, species Staphylococcus aureus, Acinetobacter baumannii, and Klebsiella pneumoniae, without purification or gene amplification steps. Furthermore, MDR A. baumannii-infected mice were successfully diagnosed using the assay. Finally, we demonstrate the on-site capture and detection of MDR bacteria through a combination of the three-dimensional nanopillar array swab and CRISPR-mediated SERS assay. This method may prove effective for the accurate diagnosis of MDR bacterial pathogens, thus preventing severe infection by ensuring appropriate antibiotic treatment. © 2020 American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acsnano.0c07264

✓ **نام ژورنال:**

ACS Nano

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

antimicrobial-resistance; bacteria; CRISPR/dCas9; nanoparticle; surface-enhanced Raman scattering

✓ **عنوان پژوهش:**

Polymer mat prepared via Forcespinning™ as a SERS platform for immobilization and detection of bacteria from blood plasma

✓ **نویسندگان:**

Witkowska E., Szymborski T., Kamińska A., Waluk J.

✓ **خلاصه پژوهش:**

One of potential applications of nano- and microscale polymer fibers is SERS-active platforms for the detection of biological compounds and microorganisms. This paper demonstrates the polymer mat obtained with Forcespinning™ technique used to detect the bacteria from blood plasma. Forcespinning™ is a new method of manufacturing of polymer fibers which can be applied to variety of polymer materials, e.g. polyethylene, nylon, PA6 and others. The method is based on the centrifugal force to draw fiber from molten polymer, which allows tuning the diameter of the fiber from tens of nanometers up to micrometers. Wide range of diameters makes the forcespun polymer mat an excellent material to filter bacteria from fluids (e.g. blood plasma, water). Covering the mat with Au:Ag alloy turns it into a SERS platform able to immobilize, detect, and identify bacteria. We provide proof-of-concept, showing detection of S. aureus, P. aeruginosa, and S. Typhimurium from blood plasma. © 2016

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.msec.2016.10.027

✓ **نام ژورنال:**

Materials Science and Engineering C

✓ **سال انتشار:**

2017

✓ **کلیدواژه‌ها:**

Bacteria detection; Forcespinning™; P. aeruginosa and S. Typhimurium; S. aureus; SERS

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Surface-enhanced raman spectroscopy for in situ measurements of signaling molecules (autoinducers) relevant to bacteria quorum sensing

✓ نویسندگان:

Pearman W.F., Lawrence-Snyder M., Angel S.M., Decho A.W.

✓ خلاصه پژوهش:

Autoinducer (AI) molecules are used by quorum sensing (QS) bacteria to communicate information about their environment and are critical to their ability to coordinate certain physiological activities. Studying how these organisms react to environmental stresses could provide insight into methods to control these activities. To this end, we are investigating spectroscopic methods of analysis that allow in situ measurements of these AI molecules under different environmental conditions. We found that for one class of AIs, N-acyl-homoserine lactones (AHLs), surface-enhanced Raman spectroscopy (SERS) is a method capable of performing such measurements in situ. SERS spectra of seven different AHLs with acyl chain lengths from 4 to 12 carbons were collected for the first time using Ag colloidal nanoparticles synthesized via both citrate and borohydride reduction methods. Strong SERS spectra were obtained in as little as 10 seconds for 80 μM solutions of AI that exhibited the strongest SERS response, whereas 20 seconds was typical for most AI SERS spectra collected during this study. Although all spectra were similar, significant differences were detected in the SERS spectra of C4-AHL and 3-oxo-C6AHL and more subtle differences were noted between all AHLs. Initial results indicate a detection limit of ~10-6 M for C6-AHL, which is within the limits of biologically relevant concentrations of AI molecules (nMμM). Based on these results, the SERS method shows promise for monitoring AI molecule concentrations in situ, within biofilms containing QS bacteria. This new capability offers the possibility to "listen in" on chemical communications between bacteria in their natural environment as that environment is stressed. © 2007 Society for Applied Spectroscopy.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1366/000370207783292244

✓ نام ژورنال:

Applied Spectroscopy

✓ سال انتشار:

2007

✓ کلیدواژه‌ها:

Acylhomoserine lactone; AHL; AI; Autoinducer molecules; Chemical communication; Quorum sensing; SERS; Silver colloid; Surface-enhanced Raman spectroscopy

✓ **عنوان پژوهش:**

Integrated SERS platform for reliable detection and photothermal elimination of bacteria in whole blood samples

✓ **نویسندگان:**

Gao X., Yin Y., Wu H., Hao Z., Li J., Wang S., Liu Y.

✓ **خلاصه پژوهش:**

Herein, an interference-free surface-enhanced Raman scattering (SERS) platform with a “sandwich” structure has been developed for reliable detection and photothermal killing of bacteria with whole blood as the real sample. The multifunctional platform comprised a plasmonic gold film (pAu) functionalized with bacteria-capturing units of 4-mercaptophenylboronic acid and internal reference of 4-mercaptobenzonitrile as the SERS substrate and vancomycin-modified core (gold)-shell (Prussian blue) nanoparticles (Au@PB@Van NPs) as the SERS tag. The detected SERS signals were from the Raman-silent region where no background signals occurred from biological sources, eliminating the interference and improving the detection sensitivity and accuracy. As a proof-of-concept, model bacterial strain, Staphylococcus aureus, was captured and detected in the whole blood samples. Furthermore, high antibacterial efficiency of approximately 100% was reached under the synergistic photothermal effect from pAu and Au@PB@Van NPs. This study provides a new avenue for bacteria detection in real samples and their subsequent in situ elimination. © 2020 American Chemical Society

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acs.analchem.0c03981

✓ **نام ژورنال:**

Analytical Chemistry

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Direct Detection of Bacteria Using Positively Charged Ag/Au Bimetallic Nanoparticles: A Label-free Surface-Enhanced Raman Scattering Study Coupled with Multivariate Analysis

✓ **نویسندگان:**

Prakash O., Sil S., Verma T., Umapathy S.

✓ **خلاصه پژوهش:**

Rapid detection and discrimination of pathogenic bacteria for food safety, environmental pollution, medical diagnoses, and chemical and biological threats remains a considerable challenge. In the present work, we demonstrate positively charged Ag/Au bimetallic nanoparticles (Ag/Au bmNPs) as a potential surface-enhanced Raman scattering (SERS) substrate for label-free detection and discrimination of three bacteria, viz., Escherichia coli, Salmonella typhimurium, and Bacillus subtilis with excellent reproducibility. The approach relies on a priori synthesis of Ag/Au bmNPs and subsequent SERS studies on bacteria. The positive surface charge on Ag/Au bmNPs offers significant advantages of short acquisition time at very low power, high sensitivity, and a simple operating procedure without the need of very specific procedures or protocols used to capture the bacteria. The reproducible and specific intrinsic fingerprint of the cell wall and intracellular components of three bacteria obtained by label-free SERS enables precise discrimination and classification of three bacteria using multivariate analyses such as principal component analysis and canonical discriminant analysis. Copyright © 2019 American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acs.jpcc.9b09311

✓ **نام ژورنال:**

Journal of Physical Chemistry C

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Optofluidic label-free SERS platform for rapid bacteria detection in serum

✓ **نویسندگان:**

Hunter R., Sohi A.N., Khatoon Z., Berthiaume V.R., Alarcon E.I., Godin M., Anis H.

✓ **خلاصه پژوهش:**

The prevalence of hospital acquired infections and antibiotic resistant pathogens necessitates the development of bacteria sensing systems that do not require sample amplification via conventional cell culturing, which can be prohibitively time-consuming. To meet this need, we designed an optofluidic Raman detection platform which utilized a microfluidic driven hollow-core photonic crystal fiber, which in combination with silver nanoparticles, provides a large enhancement to the Raman signal. By confining both light and cells within this fiber, spectral events generated by the flowing cells facilitates a novel method of cell counting to simultaneously quantify and qualify infections. Counting is performed automatically by a genetically optimized support vector machine learning algorithm that was previously developed by our group. The microfluidic system can be regenerated multiple times, and allows for online detection of planktonic bacteria to levels as low as 4 CFU/mL in 15 min. This compares favourably to other methods currently under development such as qPCR and biosensing techniques. Furthermore, Raman spectral differences between bacteria allow for inherent multiplexed detection in serum, by adding another layer to the learning algorithm. Further development of this device has promising potential as a rapid point-of-care system for infection management in the clinic. © 2019 The Authors

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.snb.2019.126907

✓ **نام ژورنال:**

Sensors and Actuators, B: Chemical

✓ **سال انتشار:**

2019

✓ **کلیدواژه‌ها:**

Hospital acquired infection; Label-free detection; Machine learning; Optofluidic; Surface enhanced Raman scattering

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Plasmon-Triggered Hot-Spot Excitation on SERS Substrates for Bacterial Inactivation and in Situ Monitoring

✓ نویسندگان:

Xu J., Xu J., Wu D., Li Y., Gao Z., Song Y.-Y.

✓ خلاصه پژوهش:

Bacterial sensing and inactivating is one of the key steps to prevent bacterial propagation and transfer. Here, using Ag nanoparticle-grafted tungsten oxide films (WO3/Ag), we developed a multifunctional platform that may act as a surface-enhanced Raman spectroscopy substrate for sensitively capturing and counting bacteria. Moreover, we demonstrated that the use of photon-triggered surface plasmon resonance of Ag on the WO3 surface resulted in a significantly improved photocatalytic activity under visible light (638 nm). The photogenerated reactive oxygen species have been shown to be efficient in the inactivation of bacteria, and the bacteria inactivation process could be monitored in situ by Raman spectroscopy. On the basis of the obtained Raman results and fluorescence measurements of green fluorescence protein expressing bacteria, the active species triggered by hot spots was demonstrated to account for broken cell walls. The bacterial cell contents subsequently leaked out, leading to cell degradation. Potentially, our work may provide a promising strategy for capturing and monitoring the bactericidal process at low concentration and, specifically, may help in the investigation of related inactivation approaches and mechanisms. © Copyright 2018 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acsami.8b09035

✓ نام ژورنال:

ACS Applied Materials and Interfaces

✓ سال انتشار:

2018

✓ کلیدواژه‌ها:

bacterial inactivation; in situ Raman detection; multifunctional SERS chip; reactive oxygen species; sterilization mechanism; surface plasmon resonance; tungsten oxide

✓ عنوان پژوهش:

Surface-enhanced raman scattering and fluorescence-based dual nanoprobes for multiplexed detection of bacterial pathogens

✓ نویسندگان:

Jang H., Hwang E.Y., Kim Y., Choo J., Jeong J., Lim D.W.

✓ خلاصه پژوهش:

Surface-enhanced Raman scattering (SERS)-based biosensing has been of growing interest for the detection of bacterial pathogens. Moreover, fluorescence (FL)-based bioimaging is also useful in that it is rapid, nearly non-destructive and has high sensitivity. In this study, for the first time, we report the preparation of dual nanoprobes based on both SERS and FL. These probes comprise hierarchical nanostructures with metallic nanoparticle clusters (MNPCs). In combination with magnetic beads (MBs), the probes were used for fast and multiplexed detection of bacterial pathogens. Both MNPCs with different Raman dyes and two sets of FL dyes were simultaneously encapsulated within polymeric nanoparticles using electrohydrodynamic (EHD) jetting and chemically stabilized. Two different sets of monoclonal antibodies (mAbs) against two kinds of bacterial pathogens, Escherichia coli and Francisella tularensis, were separately conjugated with the dual nanoprobes and the MBs. Sandwich-type immunocomplexes composed of SERS-FL dual nanoprobes, pathogens, and MBs were formed in the presence of E. coli and F. tularensis, and a linear correlation was observed between Raman intensity and pathogen concentration in the range of 102-106 cells/mL; the limit of detection was less than 102 cells/mL. Also, selective sandwich-type immunocomplexes against the pathogens were successfully imaged by FL signals at 514 nm and 633 nm wavelength for excitation. In conclusion, excellent capability of fast imaging and multiplexed detection of bacterial pathogens was achieved using a new class of SERS-FL dual nanoprobes, providing a powerful tool for qualitative and quantitative multiplexed biodetection of pathogens. Copyright © 2016 American Scientific Publishers All rights reserved.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1166/jbn.2016.2309

✓ نام ژورنال:

Journal of Biomedical Nanotechnology

✓ سال انتشار:

2016

✓ کلیدواژه‌ها:

Dual Nanoprobes; Fluorescence; Multiplexing; Pathogen Detection; Surface-Enhanced Raman Scattering

✓ **عنوان پژوهش:**

Surface enhanced Raman spectroscopy of bacteria coated by silver

✓ **نویسندگان:**

Efrima Shlomo, Bronk Burt V., Czege Jozsef

✓ **خلاصه پژوهش:**

We present a novel method to measure Raman spectra from whole bacteria cells by using Surface Enhanced Raman Scattering (SERS). We deposit a silver coat on Escherichia coli and Bacillus megaterium bacteria and measure strongly enhanced (>400,000 fold) and highly reproducible Raman spectra. The spectra are rich but not overly congested, as the surface enhancement is selective to the precise chemical nature of the biochemical molecules, and their proximity to the silver particulate matter. The main bands we observe can be associated with peptides and polysaccharides in the cell-wall and its membrane. The spectra from E. coli (a Gram-negative bacterium) and B. megaterium (a Gram-positive bacterium) are similar in their general form, but differ in detail. The spectrum from a commercial yeast extract is vastly different. This approach can be extended to probe the internal chemical environment within bacteria and applied to the identification of microorganisms also applied to studying other biochemical problems and phenomena, such as biomineralization, heavy metal toxicity, cell-wall structure and others.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

✓ **نام ژورنال:**

Proceedings of SPIE - The International Society for Optical Engineering

✓ **سال انتشار:**

1999

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Identification of methicillin-resistant: Staphylococcus aureus bacteria using surface-enhanced Raman spectroscopy and machine learning techniques

✓ نویسندگان:

Uysal Ciloglu F., Saridag A.M., Kilic I.H., Tokmakci M., Kahraman M., Aydin O.

✓ خلاصه پژوهش:

To combat antibiotic resistance, it is extremely important to select the right antibiotic by performing rapid diagnosis of pathogens. Traditional techniques require complicated sample preparation and time-consuming processes which are not suitable for rapid diagnosis. To address this problem, we used surface-enhanced Raman spectroscopy combined with machine learning techniques for rapid identification of methicillin-resistant and methicillin-sensitive Gram-positive Staphylococcus aureus strains and Gram-negative Legionella pneumophila (control group). A total of 10 methicillin-resistant S. aureus (MRSA), 3 methicillin-sensitive S. aureus (MSSA) and 6 L. pneumophila isolates were used. The obtained spectra indicated high reproducibility and repeatability with a high signal to noise ratio. Principal component analysis (PCA), hierarchical cluster analysis (HCA), and various supervised classification algorithms were used to discriminate both S. aureus strains and L. pneumophila. Although there were no noteworthy differences between MRSA and MSSA spectra when viewed with the naked eye, some peak intensity ratios such as 732/958, 732/1333, and 732/1450 proved that there could be a significant indicator showing the difference between them. The k-nearest neighbors (kNN) classification algorithm showed superior classification performance with 97.8% accuracy among the traditional classifiers including support vector machine (SVM), decision tree (DT), and naïve Bayes (NB). Our results indicate that SERS combined with machine learning can be used for the detection of antibiotic-resistant and susceptible bacteria and this technique is a very promising tool for clinical applications. This journal is © The Royal Society of Chemistry.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1039/d0an00476f

✓ نام ژورنال:

Analyst

✓ سال انتشار:

2020

✓ کلیدواژه‌ها:

✓ عنوان پژوهش:

In Situ Detection of Endotoxin in Bacteriostatic Process by SERS Chip Integrated Array Microchambers within Bioscaffold Nanostructures and SERS Tags

✓ نویسندگان:

Xiang S., Ge C., Li S., Chen L., Wang L., Xu Y.

✓ خلاصه پژوهش:

In order to achieve real-time and in situ detection of endotoxin, which is an important and significant clinical test index, surface-enhanced Raman spectroscopy (SERS) chip integrated array microchambers within bioscaffold nanostructures and a SERS monitoring strategy were proposed in this paper. After sputtering of nanogold on the cicada wing, which was selected as a natural template, and polydimethylsiloxane bonding, array-type chambers within bioscaffold nanostructures were prepared for in situ bacterial culture and monitoring of endotoxin in the bacteriostasis process by SERS. Meanwhile, the SERS tag modified with the DNA aptamer was prepared and added into this complex biochemical reaction to further improve the sensitivity and selectivity. A new method for in situ detection of endotoxin was thus established. The detection time was shortened to 100 s, and the detection limit was as low as 6.25 ng/mL. Pseudomonas aeruginosa was cultured in situ in the chamber of the SERS chip with antimicrobial agents in 0-72 h. The endotoxin released in the antibacterial process was monitored by the designed SERS detection strategy. The results obtained by SERS analysis were consistent with those of the ELISA kit. © 2020 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acsami.0c04897

✓ نام ژورنال:

ACS Applied Materials and Interfaces

✓ سال انتشار:

2020

✓ کلیدواژه‌ها:

bacteriostatic process; biochip; endotoxin; in situ detection; SERS tag

✓ **عنوان پژوهش:**

Ta@Ag Porous Array with High Stability and Biocompatibility for SERS Sensing of Bacteria

✓ **نویسندگان:**

Chen D., Ning P., Zhang Y., Jing J., Zhang M., Zhang L., Huang J., He X., Fu T., Song Z., He G., Qian D., Zhu X.

✓ **خلاصه پژوهش:**

The reliable sensing of bacteria by surface-enhanced Raman scattering (SERS) technology necessitates a rational design of a substrate with high sensitivity, stability, and minimal invasion. Hence, a bimetallic Ta@Ag film with a porous array is developed by the magnetron sputtering technique and the structure could be controlled by a Ta dopant. A porous array connected by ligaments with compact granular nanoprotrusions is a fascinating substrate for SERS sensing. It makes steady SERS signals even in harsh chemical environments due to its high structural and chemical stability. The configuration of binary Ta@Ag has higher surface free energy than that of pure Ag, and the strong bactericidal activity of Ag is suppressed efficiently. Using E. coli as a model pathogen, the Ta@Ag porous film could maintain the long-term survival rate of E. coli up to 95% and a limit of SERS detection of E. coli down to 102 CFU/mL, which is measured by the standard colony-counting method. In sum, this work provides a promising strategy to fabricate a corrosion-resistant and biocompatible bimetallic Ta@Ag film with a porous array for the SERS sensing of microbial cells. Copyright © 2020 American Chemical Society.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1021/acsami.0c03630

✓ **نام ژورنال:**

ACS Applied Materials and Interfaces

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

bacteria analysis; bimetallic Ta@Ag film; porous array; SERS sensing; stability

✓ **عنوان پژوهش:**

Rationalizing and advancing the 3-MPBA SERS sandwich assay for rapid detection of bacteria in environmental and food matrices

✓ **نویسندگان:**

Pearson B., Mills A., Tucker M., Gao S., McLandsborough L., He L.

✓ **خلاصه پژوهش:**

Bacterial foodborne illness continues to be a pressing issue in our food supply. Rapid detection methods are needed for perishable foods due to their short shelf lives and significant contribution to foodborne illness. Previously, a sensitive and reliable surface-enhanced Raman spectroscopy (SERS) sandwich assay based on 3-mercaptophenylboronic acid (3-MBPA) as a capturer and indicator molecule was developed for rapid bacteria detection. In this study, we explored the advantages and constraints of this assay over the conventional aerobic plate count (APC) method and further developed methods for detection in real environmental and food matrices. The SERS sandwich assay was able to detect environmental bacteria in pond water and on spinach leaves at higher levels than the APC method. In addition, the SERS assay appeared to have higher sensitivity to quantify bacteria in the stationary phase. On the other hand, the APC method was more sensitive to cell viability. Finally, a method to detect bacteria in a challenging high-sugar juice matrix was developed to enhance bacteria capture. This study advanced the SERS technique for real applications in environment and food matrices. © 2017 Elsevier Ltd

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.fm.2017.11.007

✓ **نام ژورنال:**

Food Microbiology

✓ **سال انتشار:**

2018

✓ **کلیدواژه‌ها:**

Bacteria detection; Food matrices; Mercaptophenylboronic acid; SERS

✓ **عنوان پژوهش:**

Optimization of substrates for surface-enhanced Raman spectroscopy of bacteria

✓ **نویسندگان:**

Fell N.F., Smith A.G.B., Vellone M., Fountain III A.W.

✓ **خلاصه پژوهش:**

The use of surface-enhanced Raman spectroscopy (SERS) has recently seen a revitalization of interest with advances in surface coating technologies and other related areas. Recent reports have indicated that enhancement factors of up to 14 orders of magnitude can be achieved, providing the sensitivity requisite to trace level detection of target analytes. Due to the short range of the SERS effect, the interference of background materials may be reduced if the target analyte can be selectively brought near the SERS surface. SERS also holds the promise of providing the ability to determine the identity of bacterial species through recognition of the unique spectrum of a given species. The first major hurdle to its application to this problem is the design and optimization of appropriate surfaces for SERS of bacteria. This is complicated by the negative surface charge of the metal surface and the bacterium that results in a repulsive force that must be overcome. Our efforts have focused on selection of the best SERS substrate for this purpose. We are examining four potential SERS substrates: Au colloids in suspension with the bacteria, Au colloids immobilized on a surface, electrochemically roughened Au surfaces, and Ag periodic particle arrays provided by Prof. Richard van Duyne.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1117/12.455735

✓ **نام ژورنال:**

Proceedings of SPIE - The International Society for Optical Engineering

✓ **سال انتشار:**

2001

✓ **کلیدواژه‌ها:**

Bacteria; Biological detection; Surface-enhanced Raman spectroscopy

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Ser-tRNAs from bovine mitochondrion form ternary complexes with bacterial elongation factor tu and GTP

✓ **نویسندگان:**

Gebhardt-Singh E., Sprinzl M.

✓ **خلاصه پژوهش:**

Transfer ribonucleic acids were isolated from mitochondria of bovine heart and aminoacylated in vitro by a crude mitochondrial enzyme. Ser-tRNAUCNSer and Ser-tRNAAGYSer were isolated and characterized by partial sequencing. Although these tRNAs possess unique structural features not found in any bacterial tRNA, they form a ternary complex with elongation factor from the extreme thermophilic bacterium Thermus thermophilus and GTP. © 1986 IRL Press Limited.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1093/nar/14.18.7175

✓ **نام ژورنال:**

Nucleic Acids Research

✓ **سال انتشار:**

1986

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

A universal SERS-label immunoassay for pathogen bacteria detection based on Fe3O4@Au-aptamer separation and antibody-protein A orientation recognition

✓ نویسندگان:

Zhou Z., Xiao R., Cheng S., Wang S., Shi L., Wang C., Qi K., Wang S.

✓ خلاصه پژوهش:

Rapid, reliable and sensitive detection methods for pathogenic bacteria are strongly demanded. Herein, we proposed a magnetically assisted surface enhanced Raman scattering (SERS)-label immunoassay for the sensitive detection of bacteria by using a universal approach based on free antibody labelling and staphylococcus proteins A (PA)-SERS tags orientation recognition. The SERS biosensor consists of two functional nanomaterials: aptamer-conjugated Fe3O4@Au magnetic nanoparticles (MNPs) as magnetic SERS platform for pathogen enrichment and PA modified-SERS tags (Au@DTNB@PA) as a universal probe for target bacteria quantitative detection. After target bacteria enriched, free antibody was used to specific marking target bacteria and provided numerous Fc fragment, which can guide the PA-SERS tags orientation-dependent binding. With this strategy, Fe3O4@Au/bacteria/SERS tags sandwich immunocomplexes for most bacteria (expect several species of Staphylococcus) were easy constructed. The limits of detection (LODs) of the proposed assay were found to be 10, 10, and 25 cells/mL for three common pathogens Escherichia coli (E. coli), Listeria monocytogenes (L. mono), and Salmonella typhimurium (S. typhi), respectively, in real food samples. The universal method also exhibits the advantages of rapid, robust, and easy to operate, suggesting its great potential for food safety monitoring and infectious diseases diagnosis. © 2021 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.aca.2021.338421

✓ نام ژورنال:

Analytica Chimica Acta

✓ سال انتشار:

2021

✓ کلیدواژه‌ها:

Bacteria detection; Orientation recognition; Staphylococcus proteins A; Surface enhanced Raman scattering; Universal SERS tags

✓ عنوان پژوهش:

PCR-coupled Paper-based Surface-enhanced Raman Scattering (SERS) Sensor for Rapid and Sensitive Detection of Respiratory Bacterial DNA

✓ نویسندگان:

Lee H.G., Choi W., Yang S.Y., Kim D.-H., Park S.-G., Lee M.-Y., Jung H.S.

✓ خلاصه پژوهش:

A paper-based surface-enhanced Raman scattering (SERS) substrate composed of silver-nanowires (AgNWs) was coupled with polymerase chain reaction (PCR) for rapid and sensitive determination of respiratory bacterial DNA. EvaGreen dye, which is a DNA intercalating molecule, was introduced to the low-cycled PCR product, and the difference in dye intercalation in the DNA structure was quantified by Raman spectroscopy to verify the presence of a target gene. Mycoplasma pneumoniae (M. Pne), was selected as a target for the sensing demonstration. At various gene concentrations and amplification cycles, detection capability of fluorescence-based real-time PCR (RT-PCR) and the PCR-coupled SERS method were compared to develop a DNA detection system capable of low-cycle amplification and sensitive DNA sensing. After 10 cycles, the PCR-coupled SERS method showed enhanced detection capability with a DNA detection limit of 3.12 pg/μL. Then, the SERS substrate was prepared as a rapid kit that included a test line and negative and positive control lines. Target DNA after 10 cycles of amplification was successfully discriminated compared to non-target DNA and it was statistically relevant. The developed system is expected to be used as a detection method for various bacteria and viruses, and also be integrated with diverse POC diagnostic systems. © 2020 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.snb.2020.128802

✓ نام ژورنال:

Sensors and Actuators, B: Chemical

✓ سال انتشار:

2021

✓ کلیدواژه‌ها:

Bacterial DNA detection; Molecular Diagnostics; Point-of-Care test (POCT); Surface Enhanced Raman Scattering

✓ **عنوان پژوهش:**

Rapid antibiotic susceptibility testing of bacteria from patients' blood via assaying bacterial metabolic response with surface-enhanced Raman spectroscopy

✓ **نویسندگان:**

Han Y.-Y., Lin Y.-C., Cheng W.-C., Lin Y.-T., Teng L.-J., Wang J.-K., Wang Y.-L.

✓ **خلاصه پژوهش:**

Blood stream infection is one of the major public health issues characterized with high cost and high mortality. Timely effective antibiotics usage to control infection is crucial for patients' survival. The standard microbiological diagnosis of infection however can last days. The delay in accurate antibiotic therapy would lead to not only poor clinical outcomes, but also to a rise in antibiotic resistance due to widespread use of empirical broad-spectrum antibiotics. An important measure to tackle this problem is fast determination of bacterial antibiotic susceptibility to optimize antibiotic treatment. We show that a protocol based on surface-enhanced Raman spectroscopy can obtain consistent antibiotic susceptibility test results from clinical blood-culture samples within four hours. The characteristic spectral signatures of the obtained spectra of Staphylococcus aureus and Escherichia coli—prototypic Gram-positive and Gram-negative bacteria—became prominent after an effective pretreatment procedure removed strong interferences from blood constituents. Using them as the biomarkers of bacterial metabolic responses to antibiotics, the protocol reported the susceptibility profiles of tested drugs against these two bacteria acquired from patients' blood with high specificity, sensitivity and speed. © 2020, The Author(s).

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1038/s41598-020-68855-w

✓ **نام ژورنال:**

Scientific Reports

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Highly efficient SERS-based detection of cerebrospinal fluid neopterin as a diagnostic marker of bacterial infection

✓ نویسندگان:

Kamińska A., Witkowska E., Kowalska A., Skoczyńska A., Gawryszewska I., Guziewicz E., Snigurenko D., Waluk J.

✓ خلاصه پژوهش:

A highly efficient recognition unit based on surface-enhanced Raman spectroscopy (SERS) was developed as a promising, fast, and sensitive tool for detection of meningococcal meningitis, which is an extremely serious and often fatal disease of the nervous system (an inflammation of the lining around the brain and spinal cord). The results of this study confirmed that there were specific differences in SERS spectra between cerebrospinal fluid (CSF) samples infected by Neisseria meningitidis and the normal CSF, suggesting a potential role for neopterin in meningococcal meningitis detection and screening applications. To estimate the best performance of neopterin as a marker of bacterial infection, principal component analysis (PCA) was performed in a selected region (640–720 cm−1) where the most prominent SERS peak at 695 cm−1 arising from neopterin was observed. The calculated specificity of 95 % and sensitivity of 98 % clearly indicate the effective diagnostic efficiency for differentiation between infected and control samples. Additionally, the limit of detection (LOD) of neopterin in CSF clinical samples was estimated. The level of neopterin was significantly higher in CSF samples infected by N. meningitidis (48 nmol/L), compared to the normal (control) group (4.3 nmol/L). Additionally, this work presents a new type of SERS-active nanostructure, based on polymer mats, that allows simultaneous filtration, immobilization, and enhancement of the Raman signal, enabling detection of spectra from single bacterial cells of N. meningitidis present in CSF samples. This provides a new possibility for fast and easy detection of bacteria in CSF and other clinical body fluids on a time scale of seconds. This method of detection produces consistent results faster and cheaper than traditional laboratory techniques, demonstrates the powerful potential of SERS for detection of disease, and shows the viability of future development in healthcare applications. © 2016, The Author(s).

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1007/s00216-016-9535-7

✓ نام ژورنال:

Analytical and Bioanalytical Chemistry

✓ سال انتشار:

2016

✓ کلیدواژه‌ها:

Bacterial infections; Cerebrospinal fluid; Neisseria meningitidis; Neopterin; Surface-enhanced Raman spectroscopy (SERS)

✓ **عنوان پژوهش:**

Bacterial meningitis pathogens identified in clinical samples using a SERS DNA detection assay

✓ **نویسندگان:**

Gracie K., Lindsay D., Graham D., Faulds K.

✓ **خلاصه پژوهش:**

This communication reports the first demonstration of the detection of Streptococcus pneumoniae and Neisseria meningitidis bacterial DNA extracted from anonymous patient CSF samples and assesses the applicability of a previously developed SERS based DNA detection assay as a platform for the detection of multiple meningitis pathogens from clinical samples. © 2015 The Royal Society of Chemistry.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/c5ay00063g

✓ **نام ژورنال:**

Analytical Methods

✓ **سال انتشار:**

2015

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Discrimination based on Gly and Arg/Ser at position 673 between dipeptidyl-peptidase (DPP) 7 and DPP11, widely distributed DPPs in pathogenic and environmental gram-negative bacteria

✓ نویسندگان:

Rouf S.M.A., Ohara-Nemoto Y., Hoshino T., Fujiwara T., Ono T., Nemoto T.K.

✓ خلاصه پژوهش:

Porphyromonas gingivalis, an asaccharolytic gram-negative rod-shaped bacterium, expresses the novel Asp/Glu-specific dipeptidyl-peptidase (DPP) 11 (Ohara-Nemoto, Y. et al. (2011) J. Biol. Chem. 286, 38115-38127), which has been categorized as a member of the S46/DPP7 family that is preferential for hydrophobic residues at the P1 position. From that finding, 129 gene products constituting five clusters from the phylum Bacteroidetes have been newly annotated to either DPP7 or DPP11, whereas the remaining 135 members, mainly from the largest phylum Proteobacteria, have yet to be assigned. In this study, the substrate specificities of the five clusters and an unassigned group were determined with recombinant DPPs from typical species, i.e., P. gingivalis, Capnocytophaga gingivalis, Flavobacterium psychrophilum, Bacteroides fragilis, Bacteroides vulgatus, and Shewanella putrefaciens. Consequently, clusters 1, 3, and 5 were found to be DPP7 with rather broad substrate specificity, and clusters 2 and 4 were DPP11. An unassigned S. putrefaciens DPP carrying Ser 673 exhibited Asp/Glu-specificity more preferable to Glu, in contrast to the Asp preference of DPP11 with Arg673 from Bacteroidetes species. Mutagenesis experiments revealed that Arg673/Ser 673 were indispensable for the Asp/Glu-specificity of DPP11, and that the broad specificity of DPP7 was mediated by Gly673. Taken together with the distribution of the two genes, all 264 members of the S46 family could be attributed to either DPP7 or DPP11 by an amino acid at position 673. A more compelling phylogenic tree based on the conserved C-terminal region suggested two gene duplication events in the phylum Bacteroidetes, one causing the development of DPP7 and DPP11 with altered substrate specificities, and the other producing an additional DPP7 in the genus Bacteroides. © 2012 Elsevier Masson SAS. All rights reserved.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.biochi.2012.11.019

✓ نام ژورنال:

Biochimie

✓ سال انتشار:

2013

✓ کلیدواژه‌ها:

Bacteroidetes; Dipeptidyl peptidase; Porphyromonas gingivalis; Proteobacteria; S46 peptidase; Substrate specificity

✓ **عنوان پژوهش:**

Microfluidic device for concentration and SERS-based detection of bacteria in drinking water

✓ **نویسندگان:**

Krafft B., Tycova A., Urban R.D., Dusny C., Belder D.

✓ **خلاصه پژوهش:**

There is a constant need for the development of easy-to-operate systems for the rapid and unambiguous identification of bacterial pathogens in drinking water without the requirement for time-consuming culture processes. In this study, we present a disposable and low-cost lab-on-a-chip device utilizing a nanoporous membrane, which connects two stacked perpendicular microfluidic channels. Whereas one of the channels supplies the sample, the second one attracts it by potential-driven forces. Surface-enhanced Raman spectrometry (SERS) is employed as a reliable detection method for bacteria identification. To gain the effect of surface enhancement, silver nanoparticles were added to the sample. The pores of the membrane act as a filter trapping the bodies of microorganisms as well as clusters of nanoparticles creating suitable conditions for sensitive SERS detection. Therein, we focused on the construction and characterization of the device performance. To demonstrate the functionality of the microfluidic chip, we analyzed common pathogens (Escherichia coli DH5α and Pseudomonas taiwanensis VLB120) from spiked tap water using the optimized experimental parameters. The obtained results confirmed our system to be promising for the construction of a disposable optical platform for reliable and rapid pathogen detection which couples their electrokinetic concentration on the integrated nanoporous membrane with SERS detection. © 2020 The Authors. Electrophoresis published by WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/elps.202000048

✓ **نام ژورنال:**

Electrophoresis

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

Bacteria; Drinking water; Microfluidics; Porous membrane; Surface-enhanced Raman spectrometry

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Sources of variability in SERS spectra of bacteria: comprehensive analysis of interactions between selected bacteria and plasmonic nanostructures

✓ **نویسندگان:**

Witkowska E., Niciński K., Korsak D., Szymborski T., Kamińska A.

✓ **خلاصه پژوهش:**

The surface-enhanced Raman spectroscopy (SERS)-based analysis of bacteria suffers from the lack of a standard SERS detection protocol (type of substrates, excitation frequencies, and sampling methodologies) that could be employed throughout laboratories to produce repeatable and valuable spectral information. In this work, we have examined several factors influencing the spectrum and signal enhancement during SERS studies conducted on both Gram-negative and Gram-positive bacterial species: Escherichia coli and Bacillus subtilis, respectively. These factors can be grouped into those which are related to the structure and types of plasmonic systems used during SERS measurements and those that are associated with the culturing conditions, types of culture media, and method of biological sample preparation. [Figure not available: see fulltext.]. © 2019, The Author(s).

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1007/s00216-019-01609-4

✓ **نام ژورنال:**

Analytical and Bioanalytical Chemistry

✓ **سال انتشار:**

2019

✓ **کلیدواژه‌ها:**

Bacillus subtilis; Escherichia coli; SERS platform; Surface-enhanced Raman spectroscopy (SERS); Wire mesh

✓ **عنوان پژوهش:**

A multifunctional SERS sticky note for real-time quorum sensing tracing and inactivation of bacterial biofilms

✓ **نویسندگان:**

Guo J., Liu Y., Chen Y., Li J., Ju H.

✓ **خلاصه پژوهش:**

Quorum sensing (QS) is crucial for bacterial survival and activity. Although detecting related signaling metabolites can reveal QS, a versatile platform for convenient real-time imaging of their secretion in the context of bacterial biofilms along with inhibition to the growth of biofilms is still highly desired. Here we develop a flexible sticky note with a sandwich structure by encapsulating gold nanostars between two pieces of hexagonal boron nitride layers, which can be easily pasted on natural biofilms to monitor in real-time the secreted signaling molecule by SERS imaging with high sensitivity and spatiotemporal resolution. Using Pseudomonas aeruginosa and its pyocyanin secretion as a model and an internal standard for self-calibration of SERS signals, the sticky note achieves reliable quantification and a rapid response to the secretion as early as 1 h biofilm growth. With antibiotic loading, the multifunctional SERS sticky note also demonstrated effective inactivation of the bacterial biofilm with simultaneous evaluation of the inactivation effect. This multifunctional SERS sticky note provides a versatile platform for investigating bacterial behaviors and developing antibacterial therapeutics. © 2018 The Royal Society of Chemistry.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/c8sc02078g

✓ **نام ژورنال:**

Chemical Science

✓ **سال انتشار:**

2018

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Quantification of biomolecules responsible for biomarkers in the surface-enhanced Raman spectra of bacteria using liquid chromatography-mass spectrometry

✓ نویسندگان:

Chiu S.W.-Y., Cheng H.-W., Chen Z.-X., Wang H.-H., Lai M.-Y., Wang J.-K., Wang Y.-L.

✓ خلاصه پژوهش:

Recently, specific biomarkers in the surface-enhanced Raman scattering (SERS) spectra of bacteria have been successfully exploited for rapid bacterial antibiotic susceptibility testing (AST)-dubbed SERS-AST. The biomolecules responsible for these bacterial SERS biomarkers have been identified as several purine derivative metabolites involved in bacterial purine salvage pathways (W. R. Premasiri, J. C. Lee, A. Sauer-Budge, R. Theberge, C. E. Costello and L. D. Ziegler, Anal. Bioanal. Chem., 2016, 408, 4631). Here we quantified these metabolites in the SERS spectra of Staphylococcus aureus and Escherichia coli using ultra-performance liquid chromatography/electrospray ionization-mass spectrometry (UPLC/ESI-MS). The time dependences of the concentrations of these molecules were measured using 13C- or 12C-purine derivatives as internal and external standards respectively in UPLC/ESI-MS measurements. Surprisingly, a single S. aureus and an E. coli cell were found to release millions of adenine and hypoxanthine into a water environment in an hour respectively. Furthermore, simulated SERS spectra of bacterial supernatants based on the mixtures of purine derivatives with measured concentrations also show great similarity with those of the corresponding bacterial samples. Our results not only provide a quantitative foundation for the emerging SERS-AST method but also suggest the potential of exploiting SERS for in situ monitoring the changes in bacterial purine salvage processes in response to different physical and chemical challenges. © 2018 the Owner Societies.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1039/c7cp07103e

✓ نام ژورنال:

Physical Chemistry Chemical Physics

✓ سال انتشار:

2018

✓ کلیدواژه‌ها:

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Planar monolithic porous polymer layers functionalized with gold nanoparticles as large-area substrates for sensitive surface-enhanced Raman scattering sensing of bacteria

✓ **نویسندگان:**

Cao Y., Lv M., Xu H., Svec F., Tan T., Lv Y.

✓ **خلاصه پژوهش:**

For the first time, large-area surface-enhanced Raman scattering sensing active substrates using porous polymer monolithic layers have been successfully prepared. Our approach includes a simple photoinitiated polymerization process using glycidyl methacrylate and ethylene dimethacrylate in a glass mold, followed by a chemical reaction of the epoxy functionalities leading to thiols, and the attachment of preformed gold nanoparticles. We demonstrated that this very simple process produced uniform and reproducible large area surfaces that significantly enhance sensitivity of Raman spectroscopy. Experiments were also carried out that confirmed preferential adsorption of living bacteria Escherichia coli from a very dilute solution on the surface of the monolithic layer, and immediate detection of the captured microorganisms using the SERS spectrum. © 2015 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.aca.2015.09.018

✓ **نام ژورنال:**

Analytica Chimica Acta

✓ **سال انتشار:**

2015

✓ **کلیدواژه‌ها:**

Bacteria; Gold nanoparticles; Monolithic layer; Porous monolith; Surface-enhanced Raman scattering

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Characterization of bacteria using its O-antigen with surface-enhanced Raman scattering

✓ **نویسندگان:**

Osorio-Román I.O., Aroca R.F., Astudillo J., Matsuhiro B., Vásquez C., Pérez J.M.

✓ **خلاصه پژوهش:**

The O-antigen determines the specificity of bacterial serotype, a sort of bacterial fingerprinting. In this work we report the extraction, purification and characterization of the O-antigen of two pathogenic bacteria, Escherichia coli O16 and Salmonella typhimurium. Molecular fingerprints found in the vibrational spectra represent a powerful analytical technique for identification (or differentiation) of molecular moieties in complex systems such as pathogens. In addition, advantages of vibrational Raman scattering are unique thanks to the high sensitivity and specificity achieved via surface-enhanced Raman scattering (SERS). SERS is used here to take advantage of characteristic vibrational frequency differences of O-antigens, thus allowing bacterial differentiation. Characteristic fundamental vibrational modes associated with the monosaccharide N-acetylglucosamine and deformations of the O-antigen chains provide the main spectroscopic differences between the O-antigens of E. coli O16 and S.typhimurium. © 2010 The Royal Society of Chemistry.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/c0an00061b

✓ **نام ژورنال:**

Analyst

✓ **سال انتشار:**

2010

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Recent advances in dual recognition based surface enhanced Raman scattering for pathogenic bacteria detection: A review

✓ **نویسندگان:**

Wang P., Sun Y., Li X., Wang L., Xu Y., He L., Li G.

✓ **خلاصه پژوهش:**

Rapid and reliable detection of pathogenic bacteria at the early stage represents a highly topical research area for food safety and public health. Although culture based method is the gold standard method for bacteria detection, recent techniques have promoted the development of alternative methods, such as surface enhanced Raman scattering (SERS). SERS provides additional advantages of high speed, simultaneous detection and characterization, multiplex analysis, and comparatively low cost. However, conventional SERS methods for bacteria detection are facing limitations of low sensitivity, susceptible to matrix interference, and poor accuracy. In recent years, specific detection of pathogenic bacteria with dual recognition based SERS methods has attracted increasing attentions. These methods include two steps recognition of target bacteria, and integrate the functions of target separation and detection. Considering their merits of excellent specificity, ultrahigh sensitivity, multiplex detection capability, and potential for on-site applications, these methods are promising alternatives for rapid and reliable detection of pathogenic bacteria. Herein, this review aims to summarize the recent advances in dual recognition based SERS methods for specific detection of pathogenic bacteria. Their advantages and limitations are discussed, and further perspectives are tentatively given. This review provides new insights into the application of SERS as a reliable tool for pathogenic bacteria detection. © 2021

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.aca.2021.338279

✓ **نام ژورنال:**

Analytica Chimica Acta

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

Complex matrices; Food safety; Pathogenic bacteria; Specific detection; Surface enhanced Raman scattering

✓ **عنوان پژوهش:**

Bacteria Inspired Internal Standard SERS Substrate for Quantitative Detection

✓ **نویسندگان:**

Liu J., Hong Z., Yang W., Liu C., Lu Z., Wu L., Foda M.F., Yang Z., Han H., Zhao Y.

✓ **خلاصه پژوهش:**

Metal-respiring bacteria are frequently used to recycle metal resources by biosynthesizing nanoparticles on its surface in environment treatment. However, further utilization of biogenetic nanoparticles through combining the advantages of both bacteria and nanoparticles is still limited. Herein, biogenetic Au@Ag nanoislands are utilized as the surface-enhanced Raman spectroscopy (SERS) substrate for quantitative detection. Specifically, Au@Ag nanoislands enhance the Raman signal via surface plasmon resonance, while biomolecules (phospholipid, tyrosine, and phenylalanine, etc.) on bacterium serve as an internal standard to eliminate the discrepancy of the target SERS intensity in different hot spots. Gene-controlled biomolecules in bacteria guarantee the reproducibility of this SERS substrate. The generality of this analytical method is demonstrated by determining rhodamine 6G, malachite green, and uric acid. This discovery solves a pervasive problem in SERS analysis through a simple biogenetic nanosystem, which opens up an avenue to address scientific challenges by using versatile organisms from nature. © 2021 American Chemical Society. All rights reserved.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acsabm.0c00263

✓ **نام ژورنال:**

ACS Applied Bio Materials

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

internal standard; microbial synthesis; noble metals; quantitative detection; SERS

✓ عنوان پژوهش:

Flexible, Reusable SERS Substrate Derived from ZIF-67 by Adjusting LUMO and HOMO and Its Application in Identification of Bacteria

✓ نویسندگان:

Xu J., Cheng C., Shang S., Gao W., Zeng P., Jiang S.

✓ خلاصه پژوهش:

Conventionally, surface-enhanced Raman spectroscopy (SERS)-active materials mainly include nanosized noble metals, semiconductors, or the complex of both, most of which are limited in practical applications because of their symbiotic materials, complex and difficult to control fabrication processes, and reuse and sampling challenges. To address these issues, novel SERS substrates have been developed in this study by anchoring zeolitic imidazolate framework-67 (ZIF-67) and derivatives of ZIF-67 to cotton fabric. The designed SERS substrates show extraordinary flexibility, an excellent enhancement factor, and reusable performance. By adjusting the lowest unoccupied molecular orbital and highest occupied molecular orbital of ZIF-67 through a doping process with different metal ions, the substrates exhibit a high enhancement factor of 6.07 × 106 and a low limit of detection of 10-8 M, as well as reusability resulting from photocatalysis. The enhancement process is studied based on charge transfer resonance, interband transition resonance, ground state charge transfer, and the light coupling effect. The results contribute to the approaches in designing SERS substrates by using ZIFs as unique SERS-active materials, and provide new insights into the development of novel SERS-active materials, along with promoting the use of SERS detection in the real world by improving the flexibility of substrates.
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✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acsami.0c15754

✓ نام ژورنال:

ACS Applied Materials and Interfaces

✓ سال انتشار:

2020

✓ کلیدواژه‌ها:

flexible; metal ion-doped ZIF-67; resonances; SERS; ZIF-67

✓ **عنوان پژوهش:**

Mapping bacteria on filter membranes, an innovative SERS approach

✓ **نویسندگان:**

Gao S., Pearson B., He L.

✓ **خلاصه پژوهش:**

The existence of pathogenic bacteria in drinking water has been a threat to the safety of human well-being. Traditional methods to detect bacteria are standard plate counts or rapid methods such as ELISA and PCR. However, those methods can be time-consuming or require pre-enrichment when detecting low concentrations of bacteria. Filter membrane has been used for bacteria collection and culturing when monitoring environmental water samples. In this study, we applied surface enhanced Raman spectroscopy (SERS) to rapidly screen bacteria cells on a filter membrane based on the unique signal from an indicator molecule, 4-mercaptophenylboronic acid (4-mpba), that can specifically bind to the surface of bacteria through diol group in its structure and give off consistent SERS signal. With a pore size of 0.22 μm, the filter membrane functions as both a concentrating device and a separation mechanism that eliminates molecules smaller than the pore size. With SERS mapping, 4-mpba gives characteristic signal, indicating the presence of bacteria, whereas no 4-mpba signal was observed in the absence of bacteria. The developed method can detect Escherichia coli, Salmonella enterica, and Listeria monocytogenes on a filter membrane non-selectively in 80 min. Application of the method in pond water was demonstrated. However, this method may not be able to discriminate between live and dead bacterial cells and further development is needed. © 2018 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.mimet.2018.03.005

✓ **نام ژورنال:**

Journal of Microbiological Methods

✓ **سال انتشار:**

2018

✓ **کلیدواژه‌ها:**

4-mercaptophenylboronic acid; Bacteria; Filtration; Gold nanoparticles; SERS

✓ **عنوان پژوهش:**

Biochemical characterization of Pkn2, a protein Ser/Thr kinase from Myxococcus xanthus, a Gram-negative developmental bacterium

✓ **نویسندگان:**

Udo H., Inouye M., Inouye S.

✓ **خلاصه پژوهش:**

Pkn2, a protein Ser/Thr kinase, from the developmental bacterium Myxococcus xanthus was expressed under a T7 promoter in Escherichia coli and purified. Purified Pkn2 retained the autophosphorylation activity with the K(m) value of 177 μM for ATP and 73 nmol/min/mg for V(max). The optimum pH and temperature were determined to be 7.5 and 35°C, respectively. The autophosphorylation activity was inhibited by staurosporine with the IC50 value of 400 nM while H-7 and genistein had little effect on this kinase. Pkn2 appears to be unique for its higher manganese dependence. This is the first biochemical characterization of the prokaryotic protein Ser/Thr kinase.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/S0014-5793(96)01384-1

✓ **نام ژورنال:**

FEBS Letters

✓ **سال انتشار:**

1997

✓ **کلیدواژه‌ها:**

Biochemical characterization; Gram-negative bacteria; Myxococcus xanthus; Pkn2

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

A Self-Calibrating Surface-Enhanced Raman Scattering-Active System for Bacterial Phenotype Detection

✓ **نویسندگان:**

Yu H., Xiao M., Lai W., Alam M.F., Zhang W., Pei H., Wan Y., Li L.

✓ **خلاصه پژوهش:**

Pathogen detection is of significant importance in human health and safety due to the high morbidity and mortality induced by bacterial infections. Therefore, the development of rapid, sensitive, and selective methods for the discrimination of pathogens is the key to improve the patient survival rates. In this work, we develop a new self-calibrating surface-enhanced Raman scattering (SERS)-based sensor that enables sensitive and reproducible pathogen detection in practical samples. The assay makes use of gold nanoflowers (AuNFs) consisting of three components: a solid Au core of ~15 nm, a hollow gap of ~1 nm, and a flower-like Au shell. We have demonstrated that the sensitive and quantitative analysis of biomolecules can be achieved by the target-dependent, sequence-specific DNA hybridization assembly between AuNFs with a built-in internal standard. We further demonstrate that this kind of reliable SERS sensor is able to distinguish different bacteria with sensitivity down to single bacterium. We expect that the established quantitative SERS technique could provide a promising tool for widespread applications in biomedical research and clinical diagnostics. Copyright © 2020 American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acs.analchem.9b05614

✓ **نام ژورنال:**

Analytical Chemistry

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Diagnosis of bacterial pathogens in the urine of urinary-tract-infection patients using surface-enhanced Raman spectroscopy

✓ **نویسندگان:**

Tien N., Lin T.-H., Hung Z.-C., Lin H.-S., Wang I.-K., Chen H.-C., Chang C.-T.

✓ **خلاصه پژوهش:**

(1) Background: surface-enhanced Raman spectroscopy (SERS) is a novel method for bacteria identification. However, reported applications of SERS in clinical diagnosis are limited. In this study, we used cylindrical SERS chips to detect urine pathogens in urinary tract infection (UTI) patients. (2) Methods: Urine samples were retrieved from 108 UTI patients. A 10 mL urine sample was sent to conventional bacterial culture as a reference. Another 10 mL urine sample was loaded on a SERS chip for bacteria identification and antibiotic susceptibility. We concentrated the urine specimen if the intensity of the Raman spectrum required enhancement. The resulting Raman spectrum was analyzed by a recognition software to compare with spectrum-form reference bacteria and was further confirmed by principal component analysis (PCA). (3) Results: There were 97 samples with single bacteria species identified by conventional urine culture and, among them, 93 can be successfully identified by using SERS without sample concentration. There were four samples that needed concentration for bacteria identification. Antibiotic susceptibility can also be found by SERS. There were seven mixed flora infections found by conventional culture, which can only be identified by the PCA method. (4) Conclusions: SERS can be used in the diagnosis of urinary tract infection with the aid of the recognition software and PCA. © 2018 by the authors.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.3390/molecules23123374

✓ **نام ژورنال:**

Molecules

✓ **سال انتشار:**

2018

✓ **کلیدواژه‌ها:**

Raman spectroscopy; SERS; Urinary tract infection

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Rapid Detection of Pathogenic Bacteria from Fresh Produce by Filtration and Surface-Enhanced Raman Spectroscopy

✓ **نویسندگان:**

Wu X., Han C., Chen J., Huang Y.-W., Zhao Y.

✓ **خلاصه پژوهش:**

The detection of Salmonella Poona from cantaloupe cubes and E. coli O157:H7 from lettuce has been explored by using a filtration method and surface-enhanced Raman spectroscopy (SERS) based on vancomycin-functionalized silver nanorod array substrates. It is found that with a two-step filtration process, the limit of detection (LOD) of Salmonella Poona from cantaloupe cubes can be as low as 100 CFU/mL in less than 4 h, whereas the chlorophyll in the lettuce causes severe SERS spectral interference. To improve the LOD of lettuce, a three-step filtration method with a hydrophobic filter is proposed. The hydrophobic filter can effectively eliminate the interferences from chlorophyll and achieve a LOD of 1000 CFU/mL detection of E. coli O157:H7 from lettuce samples within 5 h. With the low LODs and rapid detection time, the SERS biosensing platform has demonstrated its potential as a rapid, simple, and inexpensive means for pathogenic bacteria detection from fresh produce. © 2015, The Minerals, Metals & Materials Society.

✓ **لینک** DOI **(استفاده برای دانلود مقاله)**

10.1007/s11837-015-1724-x

✓ **نام ژورنال:**

JOM

✓ **سال انتشار:**

2016

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Label-free nanobiosensor to detect infectious bacterica based on SERS

✓ **نویسندگان:**

Chae E.-J., Lee J.-H., Oh B.-K., Choi J.-W.

✓ **خلاصه پژوهش:**

Bacteria detection has been important in food, water and air industry to detect contamination or infection. However, conversational bacteria detection method such as culture collection is time-consuming and complicated. In this study, Surface Enhanced Raman Scattering (SERS), one of the most convenient and reliable biosensing techniques, was applied to detect bacteria such as e. coli. First, gold nanoparticles were deposited on Indium Tin Oxide (ITO) substrate by using electrochemical method and confirmed by Scanning Electron Microscope and Ultraviolet-Visible spectroscopy. After antibody against e. coli was immobilized on the gold nanoparticles fabricated on ITO substrate, e. coli samples with different concentrations were applied to the system by antibody-antigen interaction. Then, e. coli was detected by using SERS spectroscopy, demonstrating that the SERS peak intensity at certain raman shift were good relationship with the concentration. In conclusion, this technique could be applied to the biosensor or biochip such as raw milk chip. Copyright © 2013 American Scientific Publishers All rights reserved.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1166/jbn.2013.1540

✓ **نام ژورنال:**

Journal of Biomedical Nanotechnology

✓ **سال انتشار:**

2013

✓ **کلیدواژه‌ها:**

Bacteria; Biosensor; E. Coli; Nanoparticle; Surface Enhanced Raman

✓ عنوان پژوهش:

Intracellularly grown gold nanoislands as SERS substrates for monitoring chromate, sulfate and nitrate localization sites in remediating bacteria biofilms by Raman chemical imaging

✓ نویسندگان:

Ravindranath S.P., Kadam U.S., Thompson D.K., Irudayaraj J.

✓ خلاصه پژوهش:

Understanding the chemical composition of biofilm matrices is vital in different fields of biology such as surgery, dental medicine, synthetic grafts and bioremediation. The knowledge of biofilm development, composition, active reduction sites and remediation efficacy will help in the development of effective solutions and evaluation of remediating approaches prior to implementation. Surface-enhanced Raman spectroscopy (SERS) based imaging is an invaluable tool to obtain an understanding of the remediating efficacy of microorganisms and its role in the formation of organic and inorganic compounds in biofilms. We demonstrate for the first time, the presence of chromate, sulfate, nitrate and reduced trivalent chromium in soil biofilms. In addition, we demonstrate that SERS imaging was able to validate two observations made by previous studies on chromate/sulfate and chromate/nitrate interactions in Shewanella oneidensis MR-1 biofilms. Additionally, we show a detailed Raman mapping based evidence of the existence of chromate-sulfate competition for cellular entry. Subsequently, we use Raman mapping to study the effect of nitrate on chromate reduction. The findings presented in this paper are among the first to report - detection of multiple metallic ions in bacterial biofilms using intracellular SERS substrates. Such a detailed characterization of biofilms using gold nanoislands based SERS mapping substrate can be extended to study cellular localization of other metallic ions and chemical species of biological and toxicological significance and their effect on reduction reactions in bacterial biofilms. © 2012 .

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.aca.2012.07.037

✓ نام ژورنال:

Analytica Chimica Acta

✓ سال انتشار:

2012

✓ کلیدواژه‌ها:

Bioremediation; Chemical imaging; Hexavalent chromate; Nitrate; Shewanella oneidensis MR-1; Sulfate; Surface-enhanced Raman spectroscopy (SERS)

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Surface-enhanced Raman scattering based detection of bacterial biomarker and potential surface reaction species

✓ نویسندگان:

Cheng H.-W., Luo W.-Q., Wen G.-L., Huan S.-Y., Shen G.-L., Yu R.-Q.

✓ خلاصه پژوهش:

Gold nanoparticles immobilized on gold surfaces (AuNPs/Au) function as an excellent SERS substrate for the detection of bacteria biomarkers. The possibility of the reactivity of bacteria biomarkers on such a nanoparticle-based substrate poses complications for the spectroscopic identification and quantification. This report describes new findings of an investigation of the SERS characteristics for the competitive adsorption of dipicolinic acid (DPA), which is an important biomarker from bacterial spores, and pyridine (Py), which is a possible decarboxylation product of DPA. The comparison focuses on the diagnostic region of 900-1100 cm-1 associated with the ring-breathing modes of the two molecules. While the SERS spectra in this region appeared to display some similarities between DPA and Py, distinctive differences in the detailed band characteristics were revealed for both individual and competitive adsorptions on the AuNPs/Au substrates. The fact that the equilibrium constant for the adsorption of Py on the substrate (~8 × 105 M-1) is larger than that for DPA (~2 × 105 M-1) in the measured concentration region is attributed to a stronger binding of Py to Au surface than that for DPA. The analysis of the differences has provided not only accurate speciation of the biomarker molecules on the gold nanoparticle based substrates under the SERS measurement conditions, but also has implications for expanding the application of the nanoparticle substrates for highly sensitive and selective detection of bacterial biomarkers under various reactive or non-reactive conditions. © 2010 The Royal Society of Chemistry.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1039/c0an00421a

✓ نام ژورنال:

Analyst

✓ سال انتشار:

2010

✓ کلیدواژه‌ها:

✓ **عنوان پژوهش:**

Feasibility of colloidal silver SERS for rapid bacterial screening

✓ **نویسندگان:**

Liu Y., Chao K., Nou X., Chen Y.-R.

✓ **خلاصه پژوهش:**

This study reports the feasibility of citrate-reduced colloidal silver surface-enhanced Raman scattering (SERS) for differentiating three important food borne pathogens, E. coli, Listeria, and Salmonella. FT-Raman and SERS spectra of both silver colloids and colloid-K 3PO 4 mixtures were collected and analyzed to evaluate the reproducibility and stability of silver colloids fabricated in a batch-production process. The results suggest that the reproducibility of the colloids over the batch process is high and that their binding effectiveness remains consistent over a 60-day storage period. Two specific SERS bands at 712 and 390 cm -1 were identified and used to develop simple 2-band ratios for differentiating E. coli-, Listeria-, and Salmonella-colloid mixtures with a 100% success. These results indicate that colloidal silver SERS technique may be a practical alternative method suitable for routine and rapid screening of E. coli, Listeria, and Salmonella bacteria.
© Springer Science+Business Media, LLC 2008.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1007/s11694-008-9064-y

✓ **نام ژورنال:**

Sensing and Instrumentation for Food Quality and Safety

✓ **سال انتشار:**

2009

✓ **کلیدواژه‌ها:**

E. coli; Food safety; Listeria; Salmonella; SERS; Silver colloid

✓ عنوان پژوهش:

Mutation adjacent to the active site tyrosine can enhance DNA cleavage and cell killing by the TOPRIM Gly to Ser mutant of bacterial topoisomerase I

✓ نویسندگان:

Cheng B., Sorokin E.P., Tse-Dinh Y.-C.

✓ خلاصه پژوهش:

The TOPRIM DXDXXG residues of type IA and II topoisomerases are involved in Mg(II) binding and the cleavage-rejoining of DNA. Mutation of the strictly conserved glycine to serine in Yersinia pestis and Escherichia coli topoisomerase I results in bacterial cell killing due to inhibition of DNA religation after DNA cleavage. In this study, all other substitutions at the TOPRIM glycine of Y. pestis topoisomerase I were examined. While the Gly to Ala substitution allowed both DNA cleavage and religation, other mutations abolished DNA cleavage. DNA cleavage activity retained by the Gly to Ser mutant could be significantly enhanced by a second mutation of the methionine residue adjacent to the active site tyrosine. Induction of mutant topoisomerase with both the TOPRIM glycine and active site region methionine mutations resulted in up to 40-fold higher cell killing rate when compared with the single TOPRIM Gly to Ser mutant. Bacterial type IA topoisomerases are potential targets for discovery of novel antibiotics. These results suggest that compounds that interact simultaneously with the TOPRIM motif and the molecular surface around the active site tyrosine could be highly efficient topoisomerase poisons through both enhancement of DNA cleavage and inhibition of DNA rejoining. © 2007 The Author(s).

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1093/nar/gkm1126

✓ نام ژورنال:

Nucleic Acids Research

✓ سال انتشار:

2008

✓ کلیدواژه‌ها:

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Surface-enhanced Raman spectroscopy using uncoated gold nanoparticles for bacteria discrimination

✓ **نویسندگان:**

Akanny E., Bonhommé A., Commun C., Doleans-Jordheim A., Farre C., Bessueille F., Bourgeois S., Bordes C.

✓ **خلاصه پژوهش:**

In this work, surface-enhanced Raman spectroscopy (SERS) method based on uncoated spherical gold nanoparticles as SERS substrate was applied for the detection and discrimination of three different bacterial strains: Gram-positive Bacillus subtilis and Lactobacillus rhamnosus GG and Gram-negative Escherichia coli. The exploitation of bacteria SERS spectra by multivariate data analysis (principal component analysis and partial least squares – discriminant analysis) proved the robustness of the developed method and its suitability to discriminate between the three different strains despite their relatively similar Raman signals. The SERS performance of the developed method was compared with that of the classical silver nanoparticles indicating a better bacteria signal enhancement, up to 15 times higher in case of E. coli, likely due to stronger interactions of gold nanoparticles with components such as purine molecules that show dominant bands in the bacterial SERS spectra. © 2020 John Wiley & Sons, Ltd.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/jrs.5827

✓ **نام ژورنال:**

Journal of Raman Spectroscopy

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

bacteria detection; bacteria discrimination; gold nanoparticles; SERS

✓ عنوان پژوهش:

Molecular insight into electron transfer properties of extracellular polymeric substances of electroactive bacteria by surface-enhanced Raman spectroscopy

✓ نویسندگان:

Tan B., Zhou S.F., Wang Y., Zhang B.P., Zhou L.H., Yuan Y.

✓ خلاصه پژوهش:

Extracellular polymeric substances (EPS) extracted from electroactive bacteria show promising redox activity, but the electron transfer (ET) mechanism of the EPS has been rarely elucidated because of their structural complexity and lack of efficient methodologies. In this study, the charge transfer theory of surface-enhanced Raman spectroscopy (SERS) was applied to evaluate the redox properties of EPS adsorbed on Ni and Ag nanoparticles (NPs). These metal NPs were used to simultaneously magnify Raman signals and reduce/oxidize the redox moieties in EPS. As a result, the ET between EPS and metal NPs was evaluated through the changes in Raman signals. In this regard, we compared the redox activity of EPS extracted from two typical electroactive bacteria (Shewanella oneidensis and Geobacter sulfurreducens) and another two nonelectroactive strains (Escherichia coli and Bacillus subtilis). Electrochemical measurements show that the electroactive strains have higher redox capabilities than nonelectroactive strains. The SERS analysis shows that the porphyrin present in cytochrome c is the dominating redox moiety in the EPS of electroactive bacteria. The results of this study show that SERS with active metal substrates is a sensitive tool to probe the redox response of EPS, offering an opportunity to better understand the redox nature of biomolecules. © 2019, Science China Press and Springer-Verlag GmbH Germany, part of Springer Nature.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1007/s11431-018-9437-0

✓ نام ژورنال:

Science China Technological Sciences

✓ سال انتشار:

2019

✓ کلیدواژه‌ها:

electroactive bacteria; extracellular polymeric substances; redox properties; SERS

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Quantification of a bacterial secondary metabolite by SERS combined with SLM extraction for bioprocess monitoring

✓ **نویسندگان:**

Morelli L., Andreasen S.Z., Jendresen C.B., Nielsen A.T., Emnéus J., Zór K., Boisen A.

✓ **خلاصه پژوهش:**

During the last few decades, great advances have been reached in high-throughput design and building of genetically engineered microbial strains, leading to a need for fast and reliable screening methods. We developed and optimized a microfluidic supported liquid membrane (SLM) extraction device and combined it with surface enhanced Raman scattering (SERS) sensing for the screening of a biological process, namely for the quantification of a bacterial secondary metabolite, p-coumaric acid (pHCA), produced by Escherichia coli. The microfluidic device proved to be robust and reusable, enabling efficient removal of interfering compounds from the real samples, reaching more than 13-fold up-concentration of the donor at 10 µL min-1 flow rate. With this method, we quantified pHCA directly from the bacterial supernatant, distinguishing between various culture conditions based on the pHCA production yield. The obtained data showed good correlation with HPLC analysis. © 2017 The Royal Society of Chemistry.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1039/c7an01393k

✓ **نام ژورنال:**

Analyst

✓ **سال انتشار:**

2017

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Corona-induced micro-centrifugal flows for concentration of Neisseria and Salmonella bacteria prior to their quantitation using antibody-functionalized SERS-reporter nanobeads

✓ نویسندگان:

Chen Y.-Y., Fang Y.-C., Lin S.-Y., Lin Y.-J., Yen S.-Y., Huang C.-H., Yang C.-Y., Chau L.-K., Wang S.-C.

✓ خلاصه پژوهش:

The use of microcentrifugal flows driven by ionic wind that is generated near a corona needle tip above the level of a small liquid reservoir is a technique to trap suspended bacteria within a few minutes. Gas ions are ejected at the tip of a corona needle to form an ionic wind that can swipe across the liquid/air interface inside a miniaturized reservoir to generate centrifugal vortices. This will drag suspended particles to the center of the reservoir. This article describes a method where antigen-functionalized polystyrene microspheres are first employed to mimic bacteria. The mimetic bacteria were then detected by surface-enhanced Raman scattering (SERS) signal after binding antibody-conjugated nanoaggregate-embedded beads (NAEBs) to antigen-functionalized polystyrene microspheres. The NAEBs were prepared from silica-coated gold nanoparticle aggregates and labeled with Raman reporter molecules. The work demonstrates that the particles can be concentrated at the stagnant point at the bottom of a reservoir containing 60 μL solution only by ionic wind-driven centrifugal flows. SERS signals were acquired to identify the bacteria-mimicking particles. The ionic wind flows were then applied to trap and concentrate Neisseria and Salmonella bacteria bound with antibody-conjugated NAEBs at the level of 106 colony forming units (CFU) per mL (or lower) within 10 min. The NAEBs were preferably labeled with Ethyl violet or fluorescein derivatives. The log-log calibration plot for Neisseria is linear in the 104 to 106 CFU·mL−1 concentration range. [Figure not available: see fulltext.] © 2017, Springer-Verlag Wien.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1007/s00604-017-2077-7

✓ نام ژورنال:

Microchimica Acta

✓ سال انتشار:

2017

✓ کلیدواژه‌ها:

Bacteria detection; Immunoassay; Ionic wind; Microcentrifuge; Microfluidics; Neisseria; Raman tag; Salmonella; SERS; Vortex flow

✓ **عنوان پژوهش:**

Surface-enhanced raman scattering of bacteria in microwells constructed from silver nanoparticles

✓ **نویسندگان:**

Çulha M., Yazici M.M., Kahraman M., Şahin F., Kocagöz S.

✓ **خلاصه پژوهش:**

Whole bacterial cell characterization is critically important for fast bacterial identification. Surface-enhanced Raman scattering (SERS) is proven to be powerful technique to serve such a goal. In this study, the characterization of whole bacterial cells in the microwells constructed from colloidal silver nanoparticles (AgNPs) with convective-assembly method is reported. The proper size of the microwells for the model bacteria, Escherichia coli and Staphylococcus cohnii, is determined to be 1.2m from their electron microscopy images. A minimum dilution factor of 20 is necessary for the bacterial samples collected from growth media to diminish the bacterial aggregation to place the bacterial cells into the microwells. The constructed microwell structures are tested for their bacterial SERS performance and compared to the SERS spectra obtained from the samples prepared with a simple mixing of bacteria and AgNPs for the same bacteria. The results indicate that microwell structures not only improve the spectral quality but also increase the reproducibility of the SERS spectra. Copyright © 2012 Mustafa ulha et al.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1155/2012/297560

✓ **نام ژورنال:**

Journal of Nanotechnology

✓ **سال انتشار:**

2012

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Comparative study of fluorescence and surface-enhanced Raman scattering with magnetic microparticle-based assay for target bacterial DNA detection

✓ نویسندگان:

Hwang M.J., Jang A.S., Lim D.-K.

✓ خلاصه پژوهش:

Magnetic microparticles (MMPs) have been extensively utilized in various assays as protein biomarkers or nucleic acid targets using a magnetic field owing to the diverse surface chemistry and ease of separation. In this study, we designed a simple MMP-based assay for target bacterial DNA with two different optical signals: fluorescence and Raman scattering. The sensitivity and multiplexing capability of both the signals were rigorously compared under optimized assay conditions. The MMP-based assay enabled the detection of multiple target bacterial DNAs with high reliability, sensitivity, and multiplexing capability, as demonstrated by the designed target DNA sequences from Escherichia coli, Enterococcus faecalis, and Staphylococcus aureus. The surface-enhanced Raman scattering (SERS)-based detection of the Escherichia coli genome DNA exhibited better sensitivity (~30 fM) than that of the fluorescence method. Hence, the MMP-based assay in this scheme is a promising method of detecting bacteria. Further, the results of the systematic comparison between fluorescence and surface-enhanced Raman scattering will be beneficial for future designs of assay protocols with optical signals. © 2020 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.snb.2020.129134

✓ نام ژورنال:

Sensors and Actuators, B: Chemical

✓ سال انتشار:

2021

✓ کلیدواژه‌ها:

Bacteria detection; Bacterial genomic; DNA; Magnetic microparticles; Surface-enhanced Raman scattering

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Importance of protein Ser/Thr/Tyr phosphorylation for bacterial pathogenesis

✓ **نویسندگان:**

Bonne Køhler J., Jers C., Senissar M., Shi L., Derouiche A., Mijakovic I.

✓ **خلاصه پژوهش:**

Protein phosphorylation regulates a large variety of biological processes in all living cells. In pathogenic bacteria, the study of serine, threonine, and tyrosine (Ser/Thr/Tyr) phosphorylation has shed light on the course of infectious diseases, from adherence to host cells to pathogen virulence, replication, and persistence. Mass spectrometry (MS)-based phosphoproteomics has provided global maps of Ser/Thr/Tyr phosphosites in bacterial pathogens. Despite recent developments, a quantitative and dynamic view of phosphorylation events that occur during bacterial pathogenesis is currently lacking. Temporal, spatial, and subpopulation resolution of phosphorylation data is required to identify key regulatory nodes underlying bacterial pathogenesis. Herein, we discuss how technological improvements in sample handling, MS instrumentation, data processing, and machine learning should improve bacterial phosphoproteomic datasets and the information extracted from them. Such information is expected to significantly extend the current knowledge of Ser/Thr/Tyr phosphorylation in pathogenic bacteria and should ultimately contribute to the design of novel strategies to combat bacterial infections. © 2020 The Authors. FEBS Letters published by John Wiley & Sons Ltd on behalf of Federation of European Biochemical Societies

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/1873-3468.13797

✓ **نام ژورنال:**

FEBS Letters

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

antibiotic kinase inhibitors; antibiotic resistance; BY-kinases; Hanks kinases; host–pathogen interactions; machine learning; omics integration; pathogenic bacteria; phosphoproteomics; Ser/Thr/Tyr phosphorylation

✓ **عنوان پژوهش:**

A Filter Supported Surface-Enhanced Raman Scattering "nose" for Point-of-Care Monitoring of Gaseous Metabolites of Bacteria

✓ **نویسندگان:**

Guo J., Liu Y., Yang Y., Li Y., Wang R., Ju H.

✓ **خلاصه پژوهش:**

This work designs a convenient method for fabrication of surface-enhanced Raman scattering (SERS) devices by loading gold nanostars (AuNSs) on a flat filter support with vacuum filtration. The dense accumulation of AuNSs results in a strong sensitization to SERS signal and shows sensitive response to gaseous metabolites of bacteria, which produces a SERS "nose"for rapid point-of-care monitoring of these metabolites. The "nose"shows good reproducibility and stability and can be used for SERS quantitation of a gaseous target with Raman signal. The impressive performance of the proposed SERS "nose"for detecting gaseous metabolites of common foodborne bacteria like Escherichia coli, Staphylococcus aureus, and Pseudomonas aeruginosa from inoculated samples demonstrates its much higher sensitivity than that of human sense and application in distinguishing spoiled food at an early stage and real-time tracing of food spoilage degree. The strong point-of-care testing ability of the designed SERS "nose"and the miniaturization of whole equipment extend greatly the analytical application of SERS technology in food safety and public health. Copyright © 2020 American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acs.analchem.9b05400

✓ **نام ژورنال:**

Analytical Chemistry

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Fast and green synthesis of silver nanoparticles/reduced graphene oxide composite as efficient surface-enhanced Raman scattering substrate for bacteria detection

✓ **نویسندگان:**

Li Y., Yang J., Zhong T., Zhao N., Liu Q.-Q., Shi H.-F., Xu H.-M.

✓ **خلاصه پژوهش:**

Abstract: Developing facile and environmentally friendly synthesis method to fabricate effective platforms for surface-enhanced Raman scattering (SERS) draws much attention in recent years. Herein, a fast and green method is developed to prepare silver nanoparticles/reduced graphene oxide (Ag NPs/rGO) composite, which exhibits favorable SERS activity in detecting bacteria such as Escherichia coli (E. coli) and Staphylococcus aureus (S. aureus). With high-loading and well-dispersed Ag NPs (average size of ~63 nm), the Ag NPs/rGO composite fabricated at a mass ratio of 3:1 between AgNO3 and GO presents the best SERS performance, which may be due to the optimal synergistic effect of electromagnetic enhancement originated from Ag NPs and chemical enhancement originated from rGO sheets. Furthermore, the detection sensitivity of the Ag NPs/rGO composite lowers to 1 × 105 CFU/cm3. © 2017, Springer-Verlag Wien.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1007/s00706-017-1990-0

✓ **نام ژورنال:**

Monatshefte fur Chemie

✓ **سال انتشار:**

2017

✓ **کلیدواژه‌ها:**

Ag NPs/rGO composite; E. coli and S. aureus; Surface-enhanced Raman scattering

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

SERS substrates fabricated using ceramic filters for the detection of bacteria: Eliminating the citrate interference

✓ **نویسندگان:**

Mosier-Boss P.A., Sorensen K.C., George R.D., Sims P.C., O'braztsova A.

✓ **خلاصه پژوهش:**

It was found that spectra obtained for bacteria on SERS substrates fabricated by filtering citrate-generated Ag nanoparticles (NPs) onto rigid, ceramic filters exhibited peaks due to citrate as well as the bacteria. In many cases the citrate spectrum overwhelmed that of the bacteria. Given the simplicity of the method to prepare these substrates, means of eliminating this citrate interference were explored. It was found that allowing a mixture of bacteria suspension and citrate-generated Ag NPs to incubate prior to filtering onto the ceramic filter eliminated this interference. © 2017 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.saa.2017.03.021

✓ **نام ژورنال:**

Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy

✓ **سال انتشار:**

2017

✓ **کلیدواژه‌ها:**

Bacteria; Ceramic filter; Citrate; Orbital raster scan; SERS

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✓ عنوان پژوهش:

Diagnosis of bacterial pathogens in the dialysate of peritoneal dialysis patients with peritonitis using surface-enhanced Raman spectroscopy

✓ نویسندگان:

Tien N., Chen H.-C., Gau S.-L., Lin T.-H., Lin H.-S., You B.-J., Tsai P.-C., Chen I.-R., Tsai M.-F., Wang I.-K., Chen C.-J., Chang C.-T.

✓ خلاصه پژوهش:

Background Bacterial peritonitis is the most common cause of peritoneal dialysis (PD) therapy drop-out. A quick and accurate diagnosis of the bacterial pathogen can reduce the PD drop-out rate. Surface-enhanced Raman spectroscopy (SERS) can rapidly identify bacteria using chips coated with nano-sized metal particles. Methods Known bacteria were loaded in the SERS-chips and illuminated with laser light to establish a reference Raman spectra library. Dialysate from PD peritonitis patients was concentrated by centrifuge and examined with the same SERS, and the resulting Raman spectra were compared with library spectra for bacteria identification. Principal component analysis was used for further confirmation. The same batches of dialysate were sent to routine culture as a reference bacteria identification method. The results of the 2 identification methods were compared. Results A total of 43 paired-samples were sent for study. There were 37 samples with bacteria identified but 6 were culture-negative by the reference method. 31 bacteria were identified in paired-samples by SERS, among which, 29 bacteria were exactly the same as those identified by the reference method. Bacteria not included in the reference library spectra cannot be identified. Conclusions SERS techniques can rapidly identify bacterial pathogens in the dialysate of PD peritonitis patients. © 2016 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.cca.2016.07.026

✓ نام ژورنال:

Clinica Chimica Acta

✓ سال انتشار:

2016

✓ کلیدواژه‌ها:

Dialysate; Peritoneal dialysis; Peritonitis; Principal component analysis; Raman spectroscopy; Surface-enhanced Raman spectroscopy

✓ **عنوان پژوهش:**

SERS Analysis of Bacteria, Human Blood, and Cancer Cells: a Metabolomic and Diagnostic Tool

✓ **نویسندگان:**

Premasiri W.R., Lemler P., Chen Y., Gebregziabher Y., Ziegler L.D.

✓ **خلاصه پژوهش:**

The ability to observe surface enhanced Raman scattering (SERS) at near single cell levels offers great opportunities for biomedical applications, most broadly defined, and for learning about biochemical processes of living organisms at the molecular level. This chapter illustrates the ongoing efforts to exploit SERS for these two purposes. More specifically, the state of the current progress in developing an SERS-based platform for bacterial diagnostics at near single cell levels is described. These efforts have been directed toward the identification and detection of whole bacterial cells enriched from human body fluids, for example, blood and urine, for the development of a rapid SERS-based diagnostic of bacteremia and urinary tract infections (UTIs), respectively. The authors have developed a unique multivariate data analysis approach based on principal component analysis (PCA). Efforts have been directed toward developing a SERS-based platform for strain specific bacteremia and UTI diagnostics. © 2014 John Wiley & Sons, Ltd.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1002/9781118703601.ch12

✓ **نام ژورنال:**

Frontiers of Surface-Enhanced Raman Scattering: Single Nanoparticles and Single Cells

✓ **سال انتشار:**

2014

✓ **کلیدواژه‌ها:**

Bacteremia; Bacterial cells; Cancer cells; Human blood; Principal component analysis (PCA); Surface enhanced Raman scattering (SERS); Urinary tract infections (UTIs)

✓ عنوان پژوهش:

Hydrogen bonding between the QB site ubisemiquinone and Ser-L223 in the bacterial reaction center: A combined spectroscopic and computational perspective

✓ نویسندگان:

Martin E., Baldansuren A., Lin T.-J., Samoilova R.I., Wraight C.A., Dikanov S.A., O'Malley P.J.

✓ خلاصه پژوهش:

In the QB site of the Rhodobacter sphaeroides photosynthetic reaction center, the donation of a hydrogen bond from the hydroxyl group of Ser-L223 to the ubisemiquinone formed after the first flash is debatable. In this study, we use a combination of spectroscopy and quantum mechanics/molecular mechanics (QM/MM) calculations to comprehensively explore this topic. We show that ENDOR, ESEEM, and HYSCORE spectroscopic differences between mutant L223SA and the wild-type sample (WT) are negligible, indicating only minor perturbations in the ubisemiquinone spin density for the mutant sample. Qualitatively, this suggests that a strong hydrogen bond does not exist in the WT between the Ser-L223 hydroxyl group and the semiquinone O1 atom, as removal of this hydrogen bond in the mutant should cause a significant redistribution of spin density in the semiquinone. We show quantitatively, using QM/MM calculations, that a WT model in which the Ser-L223 hydroxyl group is rotated to prevent hydrogen bond formation with the O1 atom of the semiquinone predicts negligible change for the L223SA mutant. This, together with the better agreement between key QM/MM calculated and experimental hyperfine couplings for the non-hydrogen-bonded model, leads us to conclude that no strong hydrogen bond is formed between the Ser-L223 hydroxyl group and the semiquinone O1 atom after the first flash. The implications of this finding for quinone reduction in photosynthetic reaction centers are discussed. © 2012 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/bi300834w

✓ نام ژورنال:

Biochemistry

✓ سال انتشار:

2012

✓ کلیدواژه‌ها:

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Versatile self-assembled MXene-Au nanocomposites for SERS detection of bacteria, antibacterial and photothermal sterilization

✓ نویسندگان:

Yu Z., Jiang L., Liu R., Zhao W., Yang Z., Zhang J., Jin S.

✓ خلاصه پژوهش:

The emergence of antibiotic-resistant bacterial strains has caused bacterial infections to become a more serious worldwide health problem. The development of multi-functional platform that can quickly and sensitively detect bacteria and effectively inhibit or kill bacterial is important and urgent. Herein, a novel versatile MXene-Au nanocomposite was successfully synthesized by self-assembly method for rapid detection of bacteria and photothermal sterilization. The typical gram-negative Escherichia coli (E. coli) and the gram-positive Bacillus subtilis (B. subtilis) were used as models to perform label-free, rapid and sensitive detection of bacteria based on SERS method. The antibacterial performance of the material was proved by the colony counting method, and the survival rates of E. coli and B. subtilis were as low as 8.05% and 0.06%, respectively. The Ti3C2Tx-Au nanoparticles (NPs) irradiated with 808 nm light showed significant antibacterial effect within only 6 min, and the germicidal rates for E. coli and B. subtilis were 99.25% and 100%, respectively. The photothermal conversion efficiency reached as high as 43.40%. Accordingly, this multi-functional nanocomposite material can not only detect bacteria sensitively, but also has antibacterial and photothermal sterilization effects, which provides a greatly promising countermeasure for clinical treatment of diseases caused by multi-drug resistant bacteria. © 2021

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.cej.2021.131914

✓ نام ژورنال:

Chemical Engineering Journal

✓ سال انتشار:

2021

✓ کلیدواژه‌ها:

Antibacterial; MXene; Photothermal sterilization; SERS; Ti3C2Tx-Au NPs

✓ **عنوان پژوهش:**

A live bacteria SERS platform for the: In situ monitoring of nitric oxide release from a single MRSA

✓ **نویسندگان:**

Zhang Z., Han X., Wang Z., Yang Z., Zhang W., Li J., Yang H., Ling X.Y., Xing B.

✓ **خلاصه پژوهش:**

A simple and unique surface-enhanced Raman spectroscopy (SERS) platform is developed for the precise and sensitive in situ monitoring of nitric oxide (NO) release from an individual bacterium. Using this live bacteria SERS platform, NO release from MRSA under the stress of antibiotics and co-infected bacteria was evaluated. © 2018 The Royal Society of Chemistry.

✓ **لینک** DOI **(استفاده برای دانلود مقاله)**

10.1039/c8cc02855a

✓ **نام ژورنال:**

Chemical Communications

✓ **سال انتشار:**

2018

✓ **کلیدواژه‌ها:**

TEKSAN
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✓ **عنوان پژوهش:**

Highly Sensitive Surface-Enhanced Raman Spectroscopy Substrates of Ag@PAN Electrospinning Nanofibrous Membranes for Direct Detection of Bacteria

✓ **نویسندگان:**

Yang Y., Zhang Z., Wan M., Wang Z., Zhao Y., Sun L.

✓ **خلاصه پژوهش:**

Surface-enhanced Raman spectroscopy (SERS) can be applied for biological detection because of its high sensitivity and noninvasiveness for analytes. Herein, we engineer plasmonic free-standing substrates composed of Ag nanoparticles (NPs) supported on polyacrylonitrile (PAN) electrospinning nanofibrous felts as sensors for bacterial detection. Ag NPs are evenly distributed on PAN nanofibers after preimpregnation and impregnation of PAN nanofibers in Tollens' reagent. The size and loading density of Ag NPs are tunable by adjusting the reaction time of glucose and Tollens' reagent, thereby allowing the tuning of the surface plasmon resonance. Using 4-mercaptophenol (4-MPh) and 4-mercaptobenzoic acid (4-MBA) as probe molecules, SERS effects of Ag@PAN composite nanofibers are investigated, and the substrates allow the detection of 4-MPh and 4-MBA at a low concentration of 10-9 mol/L. Importantly, the substrates exhibit a high sensitivity of SERS performance for bacterial identification without a specific bacteria-aptamer conjugation. The SERS substrates also show good uniformity of SERS response for bacterial organelles. Furthermore, the antimicrobial property was evaluated, and the results indicate that the sample of Ag@PAN nanofiber mats possesses excellent antibacterial properties against Escherichia coli and Staphylococcus aureus. Copyright © 2020 American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acsomega.0c02735

✓ **نام ژورنال:**

ACS Omega

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

✓ **عنوان پژوهش:**

Surface-enhanced Raman spectroscopic investigation of bacterial lipolysis in a skin pore phantom

✓ **نویسندگان:**

Weldon M.K., Morris M.D.

✓ **خلاصه پژوهش:**

Bacterial lipolysis of triglycerides is followed in a sebum pore phantom by microprobe surface-enhanced Raman scattering (SERS) spectroscopy. The phantom consists of a purpose-built syringe pump operating at physiological flow rates coupled to a 300 μm i.d. capillary. We employ silicon substrate SERS microprobes (50 μm×700 μm) to monitor the lipolysis products. The silicon support allows some tip flexibility that makes these probes ideal for insertion into small structures. Propionibacterium acnes (P. acnes) are immobilized on the inner surface of the capillary. These bacteria produce a lipase that hydrolyzes the triglycerides in a model sebum emulsion flowing through the capillary. The transformation is followed in vitro as changes in the SERS caused by lipolysis of triglyceride to free fatty acids. The acids adsorb as their carboxylates, and they can be readily identified by their characteristic spectra (carboxylate marker at approximately 1390 cm-1).

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1366/0003702001948321

✓ **نام ژورنال:**

Applied Spectroscopy

✓ **سال انتشار:**

2000

✓ **کلیدواژه‌ها:**

TEKSAN
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✓ **عنوان پژوهش:**

Wide-Range, Rapid, and Specific Identification of Pathogenic Bacteria by Surface-Enhanced Raman Spectroscopy

✓ **نویسندگان:**

Liu S., Hu Q., Li C., Zhang F., Gu H., Wang X., Li S., Xue L., Madl T., Zhang Y., Zhou L.

✓ **خلاصه پژوهش:**

Sensitive, selective, rapid, and label-free detection of pathogenic bacteria with high generality is of great importance for clinical diagnosis, biosecurity, and public health. However, most traditional approaches, such as microbial cultures, are time-consuming and laborious. To circumvent these problems, surface-enhanced Raman spectroscopy (SERS) appears to be a powerful technique to characterize bacteria at the single-cell level. Here, by SERS, we report a strategy for the rapid and specific detection of 22 strains of common pathogenic bacteria. A novel and high-quality silver nanorod SERS substrate, prepared by the facile interface self-assembly method, was utilized to acquire the chemical fingerprint information of pathogens with improved sensitivity. We also applied the mathematical analysis methods, such as the t-test and receiver operating characteristic method, to determine the Raman features of these 22 strains and demonstrate the clear identification of most bacteria (20 strains) from the rest and also the reliability of this SERS sensor. This rapid and specific strategy for wide-range bacterial detection offers significant advantages over existing approaches and sets the base for automated and onsite detection of pathogenic bacteria in a complex real-life situation. © 2021 The Authors. Published by American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acssensors.1c00641

✓ **نام ژورنال:**

ACS Sensors

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

AgNR substrate; bacterial diagnostics; label-free; pathogenic bacteria; receiver operating characteristic analysis; surface-enhanced Raman spectroscopy (SERS)

✓ عنوان پژوهش:

Bacteria encapsulation and rapid antibiotic susceptibility test using a microfluidic microwell device integrating surface-enhanced Raman scattering

✓ نویسندگان:

Huang H.-K., Cheng H.-W., Liao C.-C., Lin S.-J., Chen Y.-Z., Wang J.-K., Wang Y.-L., Huang N.-T.

✓ خلاصه پژوهش:

The antibiotic susceptibility test (AST) is a general laboratory procedure for bacterial identification and characterization and can be utilized to determine effective antimicrobials for individual patients. Due to the low bacterial concentration, conventional AST usually requires a prolonged bacterial culture time and a labor-intensive sample pretreatment process. Therefore, it cannot perform timely diagnosis or treatment, which results in a high mortality rate for seriously infected patients. To address this problem, we developed a microfluidic microwell device integrating surface-enhanced Raman scattering (SERS) technology, or the so called the Microwell-SERS system, to enable a rapid and high-throughput AST. Our results show that the Microwell-SERS system can successfully encapsulate bacteria in a miniaturized microwell with a greatly increased effective bacteria concentration, resulting in a shorter bacterial culture time. By attaching a microchannel onto the microwell, a smooth liquid and air exchange can purify the surrounding buffer and isolate bacteria in an individual microwell for independent SERS measurement. For proof-of-concept, we demonstrated a 2 h AST on susceptible and resistant E. coli and S. aureus with a concentration of 103 CFU mL-1 in the Microwell-SERS system, whereas the previous SERS-AST method required 108 CFU mL-1 bacterial suspension droplets dispensing on a SERS substrate. Based on the above features, we envision that the Microwell-SERS system could achieve highly sensitive, label-free, bacteria detection and rapid AST to enable timely and accurate bacterial infection disease diagnosis. © The Royal Society of Chemistry.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1039/d0lc00425a

✓ نام ژورنال:

Lab on a Chip

✓ سال انتشار:

2020

✓ کلیدواژه‌ها:

✓ عنوان پژوهش:

Mussel-inspired fabrication of SERS swabs for highly sensitive and conformal rapid detection of thiram bactericides

✓ نویسندگان:

Liu J., Si T., Zhang L., Zhang Z.

✓ خلاصه پژوهش:

As an important sort of dithiocarbamate bactericide, thiram has been widely used for fruits, vegetables and mature crops to control various fungal diseases; however, the thiram residues in the environment pose a serious threat to human health. In this work, silver nanoparticles (AgNPs) were grown in-situ on cotton swab (CS) surfaces, based on the mussel-inspired polydopamine (PDA) molecule and designed as highly sensitive surface-enhanced Raman scattering (SERS) swabs for the conformal rapid detection of bactericide residues. With this strategy, the obtained CS@PDA@AgNPs swabs demonstrated highly sensitive and reproducible Raman signals toward Nile blueA(NBA) probe molecules, and the detection limit was as low as 1.0x10-10 M. More critically, these CS@PDA@AgNPs swabs could be served as flexible SERS substrates for the conformal rapid detection of thiram bactericides from various fruit surfaces through a simple swabbing approach. The results showed that the detection limit of thiram residues from pear, grape and peach surfaces was approximately down to the level of 0.12 ng/cm2, 0.24 ng/cm2 and 0.15 ng/cm2 respectively, demonstrating a high sensitivity and excellent reliability toward dithiocarbamate bactericides. Not only could these SERS swabs significantly promote the collection effciency of thiram residues from irregular shaped matrices, but they could also greatly enhance the analytical sensitivity and reliability, and would have great potential for the on-site detection of residual bactericides in the environment and in bioscience fields. © 2019 by the authors. Licensee MDPI, Basel, Switzerland.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.3390/nano9091331

✓ نام ژورنال:

Nanomaterials

✓ سال انتشار:

2019

✓ کلیدواژه‌ها:

Flexible sers swabs; In-situ grown; On-site detection; Polydopamine; Thiram bactericides

✓ عنوان پژوهش:

Electrohydrodynamically enhanced drying droplets for concentration of Salmonella bacteria prior to their detections using antibody-functionalized SERS-reporter submicron beads

✓ نویسندگان:

Su S.-R., Chen Y.-Y., Li K.-Y., Fang Y.-C., Wang C.-H., Yang C.-Y., Chau L.-K., Wang S.-C.

✓ خلاصه پژوهش:

Gas ions can be ejected at the tip of a corona needle to form an ionic wind. When the corona needle is close to one hemispherical droplet sitting on flat glass slide, the ionic wind wiping across the liquid surface can induce micro-centrifugal vortex inside the droplet to drag suspended particles to the droplet bottom to trap at the stagnant point. Besides using this electrohydrodynamically generated ionic wind, the droplet evaporation can be enhanced because the eddy air streams around the droplet substantially increase the moisture removal rate. The liquid evaporation can induce internal fluid circulation to assemble particles on the surface. When the surface tension is significantly altered to stretch the contact line, the droplet is flatten as a liquid film to accelerate drying processes. The droplet is finally dried down. The trapped particles then become solid deposits and concentrate on the glass slide. This paper describes that the ionic wind flows were applied to evaporate a droplet of 10 μL as a liquid film within 15 min to further concentrate vortex-trapped Salmonella at the level of 1000 colony forming units (CFU) per mL (or lower), when the bacteria were bound with antibody-conjugated Raman tags made of silica-coated gold nanoparticle aggregates containing reporter molecules. Using this evaporation device, the concentration effects was concluded to be 300-fold higher than using the previous ionic wind-driven micro-centrifugal device. Using 30 μL sample volume, single CFU of Raman tag-bound Salmonella was detected, which was equivalent to about 30 CFU mL−1. © 2018 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.snb.2018.12.048

✓ نام ژورنال:

Sensors and Actuators, B: Chemical

✓ سال انتشار:

2019

✓ کلیدواژه‌ها:

Bacteria detection; Electrohydrodynamical drying; Ionic wind; Microcentrifuge; Microfluidics; SERS tag

✓ **عنوان پژوهش:**

Bacterial Detection and Differentiation via Direct Volatile Organic Compound Sensing with Surface Enhanced Raman Spectroscopy

✓ **نویسندگان:**

DeJong C.S., Wang D.I., Polyakov A., Rogacs A., Simske S.J., Shkolnikov V.

✓ **خلاصه پژوهش:**

Current methods for detecting bacterial infections, such as culture and morphological analysis of bacterial colonies, are time and labor intensive. Through the direct detection of bacterial volatile organic compounds (VOCs), via surface enhanced Raman spectroscopy (SERS), we report here a reconfigurable assay for the identification and monitoring of bacteria. We demonstrate differentiation between highly clinically relevant organisms: Escherichia coli, Enterobacter cloacae, and Serratia marcescens. This is the first differentiation of bacteria via SERS of bacterial VOC signatures. The assay also detected as few as 10 CFU/ml of E. coli in under 12 hrs, and detected E. coli from whole human blood and human urine in 16 hrs at clinically relevant concentrations of 103 CFU/ml and 104 CFU/ml, respectively. In addition, the recent emergence of portable Raman spectrometers uniquely allows SERS to bring VOC detection to point-of-care settings for diagnosing bacterial infections. © 2017 Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1002/slct.201701669

✓ **نام ژورنال:**

ChemistrySelect

✓ **سال انتشار:**

2017

✓ **کلیدواژه‌ها:**

Bacteria; SERS; surface enhanced Raman spectroscopy; VOC; Volatile organic compounds

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Fixed Escherichia coli bacterial templates enable the production of sensitive SERS-based gold nanostructures

✓ نویسندگان:

Jia K., Adam P.M., Marks R.S., Ionescu R.E.

✓ خلاصه پژوهش:

We show herein for the first time the ability to fabricate highly sensitive SERS substrates using fixed Escherichia coli bacterial cells, used as templates after glutaraldehyde fixing, whereupon stable gold nanostructures of a suitable size for SERS generation were found lying on top of bacteria after an evaporation deposition procedure, followed by high temperature annealing. Thanks to the template effect provided by the bacterial cells, gold nanoparticles had been produced forming controlled agglomerate patterns containing high density plasmonic "hot spots", thereby contributing to a remarkable enhancement of Raman signals. Moreover, a TEM copper grid marker used during the gold evaporation process, enabled to precisely correlate the optical properties (including LSPR and SERS spectra) and SEM morphology of a pre-defined area of gold nanostructures. It was observed that modulating either gold film thickness or annealing temperature, enabled to influence the LSPR properties of the produced Au NPs, and this was demonstrated by obtaining a highly sensitive SERS detection of a model compound, trans-1,2-bis(4-pyridyl)ethylene (BPE), down to 10-12 M. © 2015 Elsevier B.V. All rights reserved.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.snb.2015.01.049

✓ نام ژورنال:

Sensors and Actuators, B: Chemical

✓ سال انتشار:

2015

✓ کلیدواژه‌ها:

Bacterial template; Nanostructures; SERS detection; Trans-1;2-bis(4-pyridyl)ethylene

✓ عنوان پژوهش:

Drug-resistant Staphylococcus aureus bacteria detection by combining surface-enhanced Raman spectroscopy (SERS) and deep learning techniques

✓ نویسندگان:

Ciloglu F.U., Caliskan A., Saridag A.M., Kilic I.H., Tokmakci M., Kahraman M., Aydin O.

✓ خلاصه پژوهش:

Over the past year, the world's attention has focused on combating COVID-19 disease, but the other threat waiting at the door—antimicrobial resistance should not be forgotten. Although making the diagnosis rapidly and accurately is crucial in preventing antibiotic resistance development, bacterial identification techniques include some challenging processes. To address this challenge, we proposed a deep neural network (DNN) that can discriminate antibiotic-resistant bacteria using surface-enhanced Raman spectroscopy (SERS). Stacked autoencoder (SAE)-based DNN was used for the rapid identification of methicillin-resistant Staphylococcus aureus (MRSA) and methicillin-sensitive S. aureus (MSSA) bacteria using a label-free SERS technique. The performance of the DNN was compared with traditional classifiers. Since the SERS technique provides high signal-to-noise ratio (SNR) data, some subtle differences were found between MRSA and MSSA in relative band intensities. SAE-based DNN can learn features from raw data and classify them with an accuracy of 97.66%. Moreover, the model discriminates bacteria with an area under curve (AUC) of 0.99. Compared to traditional classifiers, SAE-based DNN was found superior in accuracy and AUC values. The obtained results are also supported by statistical analysis. These results demonstrate that deep learning has great potential to characterize and detect antibiotic-resistant bacteria by using SERS spectral data. © 2021, The Author(s).

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1038/s41598-021-97882-4

✓ نام ژورنال:

Scientific Reports

✓ سال انتشار:

2021

✓ کلیدواژه‌ها:

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Incorporation of multilayered silver nanoparticles into polymer brushes as 3-dimensional SERS substrates and their application for bacteria detection

✓ نویسندگان:

Zhang Q., Wang X.-D., Tian T., Chu L.-Q.

✓ خلاصه پژوهش:

Surface-enhanced Raman scattering (SERS) sensors have been extensively studied for ultrasensitive detection of diverse chemical or biological analytes. Facile fabrication of highly sensitive SERS substrates is believed to be of crucial importance in these analytical applications. In this regard, the preparation of 3-dimensional (3D) SERS substrates are explored via the incorporation of multilayered silver nanoparticles (AgNPs) into poly (oligo(ethylene glycol) methacrylate) (POEGMA) brushes by repeating the immersion-rinsing-drying steps for different lengths of time (i.e., the so-called in-stacking method). The POEGMA brushes of different chain lengths are synthesized by surface-initiated atom transfer radical polymerization (ATRP) with various reaction time. The resulting POEGMA/AgNP nanocomposites are characterized by FE-SEM, UV–vis and Raman spectroscopy. FE-SEM and UV–vis results indicate that the AgNPs are successfully incorporated into the POEGMA brushes with a 3D configuration. The nanocomposite films are employed as SERS substrates for the detection of a Raman reporter molecule (i.e., 4-aminothiophenol), giving rise to an enhancement factor of up to 1.29 × 10 7 and also having relatively good uniformity and reproducibility. The obtained 3D SERS substrates are also used for the detection of a typical gram-positive bacterium, Staphylococcus aureus. The limit of detection is found to be as low as ca. 8 CFU/mL. © 2017 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.apsusc.2017.02.202

✓ نام ژورنال:

Applied Surface Science

✓ سال انتشار:

2017

✓ کلیدواژه‌ها:

3D SERS substrates; 4-Aminothiophenol; POEGMA brushes; Silver nanoparticles; Staphylococcus aureus

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Surface Enhanced Raman Spectroscopy Sensor Based on Magnetic Beads-induced Nanoparticles Aggregation for Detection of Bacterial Deoxyribonucleic Acid

✓ **نویسندگان:**

MA Q., LI Y.-L., GONG N.-C., JIANG X., HUAN S.-Y.

✓ **خلاصه پژوهش:**

A novel method was developed for the highly sensitive detection of bacterial DNA by surface-enhanced Raman spectroscopy (SERS) with 5,5′-dithio-bis(2-nitrobenzoic acid) (DTNB)-modified gold nanoparticles as reporter probes and on the basis of the separation and enrichment effect of magnetic beads and the high affinity of fully complementary hybridization of DNA strands. Capture probe was immobilized onto the surface of Streptavidin-enwrapped magnetic beads (SA-MB) through the force between biotin and avidin, which hybridized with the target bacterial DNA sequence partly, and the remaining connected with the report probe decorated AuNPs with DTNB and SH-DNA (AuNPs@DTNB@DNA). Compared with previous methods, this design shortened the distance between particles by the aggregation effect of the magnetic beads to nanoparticles, and produced the plasma resonance coupling effect, which increased the SERS signal significantly. The results showed that, under the optimized conditions, the concentration of DNA in the range from 5 pM to 5 nM performed a good linear relationship with Raman intensity. The limit of detection (LOD) for bacterial DNA was estimated to be about 5 pM, showing a certain selectivity. The method was simple in design with low cost, also it was used in the sensitive and selective detection of bacterial DNA. © 2015 Changchun Institute of Applied Chemistry, Chinese Academy of Sciences

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/S1872-2040(15)60876-3

✓ **نام ژورنال:**

Chinese Journal of Analytical Chemistry

✓ **سال انتشار:**

2015

✓ **کلیدواژه‌ها:**

5,5′-Dithio-bis(2-nitrobenzoic acid); Bacterial deoxyribonucleic acid; Gold nanoparticles; Magnetic aggregation; Surface enhanced Raman spectroscopy

✓ عنوان پژوهش:

Peptidoglycan-Binding Protein Metamaterials Mediated Enhanced and Selective Capturing of Gram-Positive Bacteria and Their Specific, Ultra-Sensitive, and Reproducible Detection via Surface-Enhanced Raman Scattering

✓ نویسندگان:

Lee T., Lim J., Park K., Lim E.-K., Lee J.-J.

✓ خلاصه پژوهش:

Biological metamaterials with a specific size and spacing are necessary for developing highly sensitive and selective sensing systems to detect hazardous bacteria in complex solutions. Herein, the construction of peptidoglycan-binding protein (PGBP)-based metamaterials to selectively capture Gram-positive cells with high efficacy is reported. Nanoimprint lithography was used to generate a nanohole pattern as a template, the inside of which was modified with nickel(II)-nitrilotriacetic acid (Ni-NTA). Then, PGBP metamaterials were fabricated by immobilizing PGBP via chelation between Ni-NTA and six histidines on PGBP. Compared to the flat and spread PGBP-covered bare substrates, the PGBP-based metamaterials enabled selective capturing of Gram-positive bacteria with high efficacy, owing to enhanced interactions between the metamaterials and bacterial surface not shown in bulk materials. Thereafter, the specific strain and quantitative information of the captured bacteria was obtained by surface-enhanced Raman scattering mapping analysis in the 1 to 1 × 106 cfu/mL range within 30 min. It should be noted that no additional signal amplification process was required for lowly abundant bacteria, even at the single-bacterium level. The PGBP-based metamaterials could be regenerated multiple times with preserved sensing efficiency. Finally, this assay can detect specific Gram-positive bacteria, such as Staphylococcus aureus, in human plasma. ©

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acssensors.0c01139

✓ نام ژورنال:

ACS Sensors

✓ سال انتشار:

2020

✓ کلیدواژه‌ها:

bacteria; bacteria capturing; nanoImprint lithography; peptidoglycan-binding protein; protein-based metamaterials; sensing; surface-enhanced Raman scattering

✓ **عنوان پژوهش:**

A sensitive and rapid bacterial antibiotic susceptibility test method by surface enhanced Raman spectroscopy

✓ **نویسندگان:**

Fu S., Wang X., Wang T., Li Z., Han D., Yu C., Yang C., Qu H., Chi H., Wang Y., Li S., Tian B., Li W., Xia Z.

✓ **خلاصه پژوهش:**

This study aims to develop a rapid bacterial antibiotic susceptibility test (AST) method by Bacteria-aptamer@AgNPs–surface enhanced Raman spectroscopy (SERS) and further evaluate the influence of different antibiotics on the Raman intensity of bacteria. The Raman intensity of Escherichia coli O157:H7 (E. coli O157:H7) and Staphylococcus aureus (S. aureus) in the presence of different concentrations of antibiotics in 2 h was detected by Bacteria-aptamer@AgNPs-SERS in this study. Our results found that the bacteria Raman signal peak at 735 cm−1 and the minimum inhibitory concentration (MIC) value was determined in 1 h according to Raman signals. In 2 h, the bacteria Raman signal growth at sub-MIC concentrations of four different kinds of antibiotics and the bacteria colony-forming unit (CFU) have similar enhancements. SERS utilizes special functions of rough metal surfaces and offers a huge enhancement of Raman intensities with reduced fluorescence backgrounds, which makes it an ultrasensitive tool of detection. This rapid AST method and the enhancement effect should be of value in search of new antibiotic drugs. © 2020, Sociedade Brasileira de Microbiologia.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1007/s42770-020-00282-5

✓ **نام ژورنال:**

Brazilian Journal of Microbiology

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

Antibiotic susceptibility; Antibiotics; MIC; SERS

✓ عنوان پژوهش:

Rapid identification and quantification of the antibiotic susceptibility of lactic acid bacteria using surface enhanced Raman spectroscopy

✓ نویسندگان:

Wang P., Wang X., Sun Y., Gong G., Fan M., He L.

✓ خلاصه پژوهش:

Overuse and misuse of antibiotics have resulted in wide antibiotic resistance in bacteria. In this study, surface-enhanced Raman spectroscopy (SERS) was used to rapidly characterize the responses of lactic acid bacteria (LAB) to antibiotics targeting the bacterial cell wall. Lactobacillus delbrueckii subsp. bulgaricus (Lb. bulgaricus) ATCC 11842 was used to represent LAB strains that are widely used in the food industry. Penicillin G, ampicillin and vancomycin were used to treat Lb. bulgaricus ATCC 11842 at different toxic levels for 30, 60 and 90 min, respectively. SERS spectra of Lb. bulgaricus after each treatment were collected to characterize the responses of Lb. bulgaricus. The collected spectra were analyzed by principal component analysis (PCA) and partial least squares regression (PLSR). Results suggested that all three antibiotics induced significant peak changes in LAB, and the spectral changes induced by each antibiotic treatment were significantly different. Moreover, the antibiotic-induced spectral changes in Lb. bulgaricus had good correlation with its proliferation ability and could be potentially used as a base for rapid quantification of the antibiotic susceptibility of bacteria. The developed method could detect the reaction of LAB to antibiotic treatments within 3 h. Therefore, the developed SERS method has the potential to be used to rapidly discriminate and quantify the antibiotic susceptibility of LAB. Moreover, such a rapid and direct method could contribute to microbial antibiotic susceptibility detection research. © 2020 The Royal Society of Chemistry.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1039/c9ay01659g

✓ نام ژورنال:

Analytical Methods

✓ سال انتشار:

2020

✓ کلیدواژه‌ها:

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

A novel bacterial signalling system with a combination of a Ser/Thr kinase cascade and a His/Asp two-component system

✓ **نویسندگان:**

Lux R., Shi W.

✓ **خلاصه پژوهش:**

Prokaryotes and eukaryotes have long been thought to use very different types of kinases (the His kinases of the 'bacterial' two-component systems versus the 'eukaryotic' Ser/Thr/Tyr kinases) to carry out signal transduction. This paradigm no longer holds true, because both systems are now found together in an increasing number of prokaryotic organisms and 'two-component' His kinase are present in eukaryotes. Pioneering work on bacterial protein serine threonine kinases (PSTKs) has been performed in Myxococcus xanthus, a soil bacterium with a complex life cycle that possesses orthologues of signalling-related kinases 'typical' of both the prokaryotic and the eukaryotic kingdoms. In the work reported in this volume of Molecular Microbiology, Nariya and Inouye describe a PSTK cascade that modulates the biochemical activity of MrpC, a CRP-like transcriptional regulator for essential developmental signalling pathways in M. xanthus whose transcription is under the control of a two-component system. This is the first report of both a functional PSTK cascade in bacteria and the use of both PSTK and two-component systems to control a single complex bacterial signalling event. © 2005 The Authors. Journal compilation © 2005 Blackwell Publishing Ltd.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1111/j.1365-2958.2005.04856.x

✓ **نام ژورنال:**

Molecular Microbiology

✓ **سال انتشار:**

2005

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Combination of bacitracin-based flocculant and surface enhanced Raman scattering labels for flocculation, identification and sterilization of multiple bacteria in water treatment

✓ نویسندگان:

Zhang S., Tang X., Zheng H., Wang D., Xie Z., Ding W., Zheng X.

✓ خلاصه پژوهش:

Bacteria, especially antibiotic-resistant bacteria, in water threaten public health in countries. Simultaneous flocculation, sterilization and identification of bacteria are great challenge in water treatment. Herein we presented a three-in-one compound through combining a novel Bacitracin-based flocculant (B-g-PAMDAC) and surface enhanced Raman scattering (SERS) labels, the modified Au@AgNPs using graphene oxide (GO) and 4-mercaptophenylboronic acid (4-MPBA). B-g-PAMDAC with bactericidal groups and microblock structure was synthesized via copolymerization and self-assembly. Its functional groups and microblock structure contributed to the excellent performance in flocculation of bacteria. 4-MPBA as bacterial capture bound to the bacterial cell membrane and contributed to recognition of bacteria in flocculation. Bacteria aggregating around Au@AgNPs resulted in abundant “hot spots” and strong Raman signals. SERS labels obviously improved the sensitivity, accuracy and stability of bacteria identification even at low bacterial concentration of 1 × 103 CFU mL−1. They presented distinct fingerprints of bacteria, Escherichia coli, Pseudomonas aeruginosa, Bacillus cereus and Enterococcus faecalis, in Raman mappings. Bacitracin improved sterilization efficiency of B-g-PAMDAC in four bacteria treatment in terms of sterilization rate and time. β-galactosidase and respiratory activity of bacteria revealed sterilization mechanism of B-g-PAMDAC that changed permeability of cell membrane before it reduced the respiration activity of bacteria and ruptured cell wall. © 2020 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.jhazmat.2020.124389

✓ نام ژورنال:

Journal of Hazardous Materials

✓ سال انتشار:

2021

✓ کلیدواژه‌ها:

Fingerprint peak; Flocculation; Identification; SERS labels; Sterilization mechanism

✓ **عنوان پژوهش:**

Improvement of Surface-Enhanced Raman Scattering Method for Single Bacterial Cell Analysis

✓ **نویسندگان:**

Yan Y., Nie Y., An L., Tang Y.-Q., Xu Z., Wu X.-L.

✓ **خلاصه پژوهش:**

Surface-enhanced Raman scattering (SERS) is a useful tool for label-free analysis of bacteria at the single cell level. However, low reproducibility limits the use of SERS. In this study, for the sake of sensitive and reproducible Raman spectra, we optimized the methods for preparing silver nanoparticles (AgNPs) and depositing AgNPs onto a cell surface. We found that fast dropwise addition of AgNO3 into the reductant produced smaller and more stable AgNPs, with an average diameter of 45 ± 4 nm. Compared with that observed after simply mixing the bacterial cells with AgNPs, the SERS signal was significantly improved after centrifugation. To optimize the SERS enhancement method, the centrifugal force, method for preparing AgNPs, concentration of AgNPs, ionic strength of the solution used to suspend the cells, and density of the cells were chosen as impact factors and optimized through orthogonal experiments. Finally, the improved method could generate sensitive and reproducible SERS spectra from single Escherichia coli cells, and the SERS signals primarily arose from the cell envelope. We further verified that this optimal method was feasible for the detection of low to 25% incorporation of 13C isotopes by the cells and the discrimination of different bacterial species. Our work provides an improved method for generating sensitive and reproducible SERS spectra. © Copyright © 2020 Yan, Nie, An, Tang, Xu and Wu.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.3389/fbioe.2020.573777

✓ **نام ژورنال:**

Frontiers in Bioengineering and Biotechnology

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

bacteria; bacteria detection; Raman microscopy; SERS; single cell analysis

✓ عنوان پژوهش:

Preparation of Ag@PDA@SiO2 electrospinning nanofibrous membranes for direct bacteria SERS detection and antimicrobial activities

✓ نویسندگان:

Wan M., Zhao H., Wang Z., Zhao Y., Sun L.

✓ خلاصه پژوهش:

In this paper, a convenient method to fabricate flexible and free-standing surface-enhanced Raman scatting (SERS) substrates for direct bacteria detection without aptamer bonding is presented. SiO2 nanofibers were prepared via electrospinning and calcination by using tetraethyl orthosilicate as the precursor. Subsequently, it was coated with polydopamine (PDA) by self-polymerization. Finally, Ag@PDA@SiO2 nanofibrous membranes were obtained through in situ growth of Ag nanoparticles in Tollens' reagents. The as-prepared Ag@PDA@SiO2 composite nanofibrous membranes were characterized by techniques of scanning electron microscopy, transmission electron microscopy, X-ray powder diffraction, energy-dispersive x-ray spectroscopy and thermo gravimetric analysis. The flexibility of the as-prepared nanofibrous membranes were verified simply through manual folding. Small molecule probes of 4-mercaptophenol (4-MPh) and 4-mercaptobenzoic acid (4-MBA) were chosen to investigate the SERS sensitivity of the as-prepared Ag@PDA@SiO2 as free-standing substrates. Furthermore, Escherichia coli (E. coli) and Staphylococcus aureus (S. aureus), as typical strains of Gram-negative and Gram-positive bacteria, were performed to directly SERS detection by dropping bacteria suspension onto the fibrous membranes without any previous treatment, such as aptamer combination. In addition, the antimicrobial properties of the as-prepared Ag@PDA@SiO2 electrospinning nanofibrous membranes were tested by inhibition zone and turbidity methods. The results show that Ag nanoparticles with an average diameter of 50 nm are uniformly deposited on the surface of electrospinning nanofibers, and the as-prepared Ag@PDA@SiO2 nanofibrous membranes are flexible. As SERS substrates, it shows a rather high detection limitation of 10–11 mol l–1 for 4-MPh and 4-MBA. More importantly, this substrate can be applied for bacteria label-free SERS detection, i.e., complicated procedures are avoided. Meanwihile, the as-prepared Ag@PDA@SiO2 nanofibrous membranes exhibit excellent antibacterial properties. Thus, it has application prospects in trace bacteria detection and water purification. © 2020 The Author(s). Published by IOP Publishing Ltd

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1088/2053-1591/abb8a0

✓ نام ژورنال:

Materials Research Express

✓ سال انتشار:

2020

✓ کلیدواژه‌ها:

Ag nanoparticles; Bacteria detection; Electrospinning; SERS; SiO2 nanofibers

✓ **عنوان پژوهش:**

SERS-based immunocapture and detection of pathogenic bacteria using a boronic acid-functionalized polydopamine-coated Au@Ag nanoprobe

✓ **نویسندگان:**

Wang Y., Li Q., Zhang R., Tang K., Ding C., Yu S.

✓ **خلاصه پژوهش:**

A surface-enhanced Raman scattering (SERS)-based immunocapture nanoprobe is described for the detection of pathogenic bacteria. The probe uses boronic acid-functionalized polydopamine-coated Au@Ag nanoparticles as an advanced SERS nanotag. Modified magnetic IgG@Fe3O4 nanoparticles are used for magnetic separation. Au@Ag@PDA nanoparticles, where PDA stands for polydopamine, were functionalized with boronic acid to bind to pathogenic bacteria and induce signal amplification. The Raman signal is amplified 108 times when the SERS tag binds the surface of bacteria. The SERS spectra exhibit fingerprint-like patterns that enable bacterial classification. The results of principal component analysis (PCA) and hierarchical cluster analysis (HCA) of the spectral regions were compared. The bacterial surface protein and glycan signals (1300–1450 cm−1) were the best regions for bacterial classification. Staphylococcus aureus, Escherichia coli, Shigella dysenteriae, Pseudomonas aeruginosa, and Klebsiella pneumonia were successfully classified by this method. The lowest detection limit was 10 colonies/mL (CFU·mL). The assay can be completed within 30 min. Conceivably, this method may be extended to the quantitative detection or classification of bacteria under various other conditions. [Figure not available: see fulltext.]. © 2020, Springer-Verlag GmbH Austria, part of Springer Nature.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1007/s00604-020-04248-0

✓ **نام ژورنال:**

Microchimica Acta

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

Bacterial identification; Hierarchical cluster analysis (HCA); Principal component analysis (PCA); Raman spectroscopy; SERS

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Synthesis of Photothermally Stable Triangular Silver Nanoplates for SERS Applications, Photokilling of Bacteria

✓ **نویسندگان:**

Fan R., Yang Y., Xue J., Zhang F., Sun J., Xu H., Jiang T.

✓ **خلاصه پژوهش:**

We developed a facile seeded-growth strategy to synthesize triangular silver nanoplates with enhanced photothermal stability, in which zwitterionic buffers, hydroquinone (HQ) served as shape-directing, reducing agents, respectively. Compared to the Ag nanoplates synthesized by the thermal methods reported before, the Ag nanoplates prepared in this study still retained the sharp tips of nanoplates, maintained excellent near infra-red (NIR) surface plasmon resonance (SPR) properties after repeated NIR irradiation. The enhanced photothermal stability could enable the as-prepared Ag nanoplates serve as stable substrates for bacterial surface enhanced Raman scattering (SERS) applications. Meanwhile, the Ag nanoplates synthesized in this study also yielded a steady-state photothermal conversion efficiency up to 40%, giving effective photothermal therapy (PTT) towards antibiotic resistant bacteria. © 2019 Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/cnma.201900603

✓ **نام ژورنال:**

ChemNanoMat

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

Antimicrobial Photothermal therapy (aPTT); Near infra-red (NIR); Photothermal stability; Silver nanoplates (AgNPls); Surface enhanced Raman scattering (SERS) application

✓ **عنوان پژوهش:**

Label-Free Detection of Bacteria Using Surface-Enhanced Raman Scattering and Principal Component Analysis

✓ **نویسندگان:**

Cozar I.B., Colniţă A., Szöke-Nagy T., Gherman A.M.R., Dina N.E.

✓ **خلاصه پژوهش:**

Recently, the possibility of creating surface-enhanced Raman scattering (SERS)-based biosensors for rapid detection of bacteria has been widely explored. For this purpose, we used ultrasensitive SERS spectroscopy to detect and identify common bacteria's spectral profiles in different experimental conditions: using in situ-synthesized silver colloids (Bacteria@AgNPs) and incubation of the biomass in silver colloids. Moreover, a label-free SERS-based detection protocol was optimized and the influences of taxonomic affiliation and time-dependent effects of incubation in silver colloid were monitored. Label-free detection and identification at single-cell level of common pathogens (Escherichia coli, Aeromonas hydrophila, and Bacillus cereus) were assessed using SERS mapping under the optimized experimental conditions. High-accuracy principal component analysis (PCA) was used for discrimination at strain level of the tested bacterial species. The reduced volume of sample required (3 µL), rapid spectral acquisition (within minutes), and the use of SERS mapping at single-cell level provide an ideal candidate for developing SERS-based biosensors for food safety, water research, and health care real-life applications. © 2018, © 2018 Taylor & Francis.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1080/00032719.2018.1445747

✓ **نام ژورنال:**

Analytical Letters

✓ **سال انتشار:**

2019

✓ **کلیدواژه‌ها:**

Bacteria; label-free detection; principal component analysis (PCA); single-cell; surface-enhanced Raman scattering (SERS) mapping

✓ **عنوان پژوهش:**

Differentiation of bacterial strains by means of surface enhanced ft-raman spectroscopy [Paviršiumi sustiprintos ft ramano spektroskopijos taikymas bakterijų padermių nustatymui]

✓ **نویسندگان:**

Kairyte K., Luksiene Z., Pucetaite M., Sablinskas V.

✓ **خلاصه پژوهش:**

The silver nanoparticle colloid was used to obtain surface enhanced Raman spectra of Listeria monocytogenes, Salmonela enterica, and Esherichia coli bacteria. The SERS spectra were captured using for excitation the near-infrared (1064 nm) laser radiation with reduced intensity, which ensured the prevention of the fluorescence background as well as photo- and thermal decomposition of the samples. It was found that the optimal size of silver nanoparticles for the enhancement of the Raman signal in the near-infrared spectral region is ca. 50 nm. The spectral data obtained in this study indicate that relative intensities of SERS spectral bands of bacteria can be used for spectral differentiation of bacteria. In case of Listeria, Salmonela, and Esherichia cells, the intensity ratio of spectral bands of adenine and cysteine can be used as a spectral marker for differentiation of the bacteria. © Lietuvos mokslu{ogonek} akademija, 2012.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.3952/physics.v52i3.2480

✓ **نام ژورنال:**

Lithuanian Journal of Physics

✓ **سال انتشار:**

2012

✓ **کلیدواژه‌ها:**

Bacteria identification and differentiation; SERS; Silver colloid

✓ **عنوان پژوهش:**

Antifouling superhydrophobic surfaces with bactericidal and SERS activity

✓ **نویسندگان:**

Sahin F., Celik N., Ceylan A., Pekdemir S., Ruzi M., Onses M.S.

✓ **خلاصه پژوهش:**

Fouling and contamination of surfaces are prevailing challenges humanities facing today in fields such as healthcare, hospitality, and food manufacturing. These challenges strongly motivate the development of multifunctional surfaces with antifouling and antimicrobial properties that are coupled with sensing capabilities. To address this challenge, we prepared a multifunctional superhydrophobic surface using eco-friendly materials: polydimethylsiloxane (PDMS) and carnauba wax. After deposition of a thin film of Ag, the surface gained surface-enhanced Raman scattering (SERS) activity and bactericidal property. The multifunctional superhydrophobic surface showed extreme liquid repellency towards water and common liquid food. The strong SERS activity enabled the detection of adulterant rhodamine B in a sausage down to a nanomolar level. Notably, the surface showed excellent bactericidal activity towards two common bacteria, E. coli, and S. aureus, significantly reducing their adhesion and killing. Additionally, the surface showed anti-fouling behavior against common liquid food, and even towards sticky foods such as yogurt, honey, and pomegranate sauce, reducing residual food by >97 %. Furthermore, the superhydrophobic surface showed excellent chemical stability in dynamic and static flow conditions and leaching of Ag in neutral and basic solutions was minimal. © 2021 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.cej.2021.133445

✓ **نام ژورنال:**

Chemical Engineering Journal

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

Antibacterial; Antifouling; Food packaging; SERS; Superhydrophobic surfaces

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

In-situ growth of gold nanoparticles on electrospun flexible multilayered PVDF nanofibers for SERS sensing of molecules and bacteria

✓ نویسندگان:

Chen D., Zhang L., Ning P., Yuan H., Zhang Y., Zhang M., Fu T., He X.

✓ خلاصه پژوهش:

Plasmonic surface of flexible multilayered nanofibers possesses special superiority for the surface-enhanced Raman scattering (SERS) sensing of molecules and microbial cells. However, the fabrication of flexible plasmonic nanofibers with high sensitivity and reproducibility is difficult. Herein, we report a smart strategy for fabricating flexible plasmonic fibers, in which compact and homogeneous gold nanoparticles (Au NPs) are in-situ grown on the high-curvature surface of multilayered fibers of electrospun polyvinylidene fluoride (PVDF). Firstly, the surface of PVDF fibers is changed electrically, and Au seeds are deposited on the surface of PVDF fibers using electrostatic driving force. Secondly, a stable AuI4− complex is formed employing coordination between I− and AuCl4− ions, which could decrease the reduction potential of AuCl4− and restrain the self-nucleation, and then the reduction reaction of AuI4− is initiated by introducing PVDF@Au seeds to pull down the barrier of potential energy. Finally, in-situ growth of AuNPs is generated on the high-curvature surface of PVDF nanofibers, and large-scale hotspots are generated by adjacent AuNPs coupling in the three-dimensional (3D) space of multilayered fibers. Membrane of PVDF@Au nanofibers also realizes the sensitive detection of thiram molecules (low limit of detection of 0.1 nM) and good reproducibility (relative standard deviation of 10.6%). Meanwhile, due to the multilayered construction of PVDF@Au nanofibers, a valid SERS signal on 3D surface of bacteria could be generated. 3D distribution of hotspots on multilayered PVDF@Au nanofibers gives a clear advantage for SERS sensing of organic molecules and microbial cells.[Figure not available: see fulltext.] © 2021, Tsinghua University Press and Springer-Verlag GmbH Germany, part of Springer Nature.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1007/s12274-021-3530-9

✓ نام ژورنال:

Nano Research

✓ سال انتشار:

2021

✓ کلیدواژه‌ها:

bacteria sensing; electrospinning polyvinylidene fluoride (PVDF); flexible surface-enhanced Raman scattering (SERS) substrate; in-situ growth of gold; three-dimensional (3D) multilayered nanofibers

✓ عنوان پژوهش:

Fuzzy characterization and classification of bacteria species detected at single-cell level by surface-enhanced Raman scattering

✓ نویسندگان:

Dina N.E., Gherman A.M.R., Colniță A., Marconi D., Sârbu C.

✓ خلاصه پژوهش:

Advanced chemometric methods, such as fuzzy c-means, a semi-supervised clustering method, and fuzzy linear discriminant analysis (FLDA), a new robust supervised classification method in combination with principal component analysis (PCA), namely PCA-FLDA, have been successfully applied for characterization and classification of bacterial species detected at single-cell level by surface-enhanced Raman scattering (SERS) spectroscopy. SERS spectra of three species (S. aureus, E. faecalis and P. aeruginosa) were recorded in an original fashion, using in situ laser induced silver spot as metallic substrate. The detection process of bacteria was isolated inside a hermetically sealed in-house built microfluidic device, connected to a syringe pump for injecting the analytes and a portable Raman spectrometer as detection tool. The obtained results (fuzzy partitions) and spectra of the prototypes (robust fuzzy spectra mean corresponding to each fuzzy partition) clearly demonstrated the efficiency and information power of the advanced fuzzy methods in bacteria characterization and classification based on SERS spectra, and allowed a rationale assigning to a specific group. Also, this powerful detection and classification methodology generates the premises for future investigations of Raman and other spectroscopic data obtained for various samples. © 2020 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.saa.2020.119149

✓ نام ژورنال:

Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy

✓ سال انتشار:

2021

✓ کلیدواژه‌ها:

Data analysis; Fuzzy clustering and classification; SERS on bacteria; Single-cell SERS spectra

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

SERS characterization of aggregated and isolated bacteria deposited on silver-based substrates

✓ **نویسندگان:**

Andrei C.-C., Moraillon A., Larquet E., Potara M., Astilean S., Jakab E., Bouckaert J., Rosselle L., Skandrani N., Boukherroub R., Ozanam F., Szunerits S., Gouget-Laemmel A.C.

✓ **خلاصه پژوهش:**

Surface-enhanced Raman scattering (SERS), based on the enhancement of the Raman signal of molecules positioned within a few nanometres from a structured metal surface, is ideally suited to provide bacterial-specific molecular fingerprints which can be used for analytical purposes. However, for some complex structures such as bacteria, the generation of reproducible SERS spectra is still a challenging task. Among the various factors influencing the SERS variability (such as the nature of SERS-active substrate, Raman parameters and bacterial specificity), we demonstrate in this study that the environment of Gram-positive and Gram-negative bacteria deposited on ultra-thin silver films also impacts the origin of the SERS spectra. In the case of densely packed bacteria, the obtained SERS signatures were either characteristic of the secretion of adenosine triphosphate for Staphylococcus aureus (S. aureus) or the cell wall and the pili/flagella for Escherichia coli (E. coli), allowing for an easy discrimination between the various strains. In the case of isolated bacteria, SERS mapping together with principal component analysis revealed some variabilities of the spectra as a function of the bacteria environment and the bactericidal effect of the silver. However, the variability does not preclude the SERS signatures of various E. coli strains to be discriminated. Graphical abstract: [Figure not available: see fulltext.] © 2021, Springer-Verlag GmbH Germany, part of Springer Nature.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1007/s00216-020-03106-5

✓ **نام ژورنال:**

Analytical and Bioanalytical Chemistry

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

Aggregated and single bacteria; Escherichia coli; Principal component analysis (PCA); Silver nanostructures; Staphylococcus aureus; Surface-enhanced Raman scattering (SERS)

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Printer-assisted array flexible surface-enhanced Raman spectroscopy chip preparation for rapid and label-free detection of bacteria

✓ نویسندگان:

Yang F., Chen L., Li D., Xu Y., Li S., Wang L.

✓ خلاصه پژوهش:

A low-cost array flexible surface-enhanced Raman spectroscopy (SERS) chip was proposed with the aim of rapid detection of bacteria. The substrate of the chip was Al foil, and the detection area arrays were printed using a laser toner. Colloidal silver nanoparticles (AgNPs) were dropped onto the detection area, with the AgNPs droplets confined within the detection area by the hydrophobic properties of the toner film. The colloidal AgNPs were dried naturally to form a SERS active chip. An A4 paper-based SERS chip was prepared using the same method for control experiments. The surface morphology of the chip was characterized by field emission scanning electron microscopy. In addition, comparison experiments were performed on the two SERS chips. The results showed that both SERS chips exhibited the best SERS enhancement when the AgNPs were added four times. The calculation of Rhodamine 6G at the 612 cm−1 peak showed that the EF of the A4 paper-based chip and the Al foil-based chip were 6.72 × 107 and 1.03 × 108, respectively. SERS mapping results showed that the Al foil-based chip had much higher signal homogeneity than that of A4 paper-based chip. Lastly, the Al foil-based chip was used for bacterial detection. For Escherichia coli and Staphylococcus aureus, the limit of detection was 1,000 and 100 cfu/ml, and the relative standard deviation of 36 randomly selected detection points were 12.5% and 11.7%, respectively. The entire detection process was completed in a few minutes. The SERS chip has the advantages of low cost, simple manufacturing process, and short detection time; is capable of high throughput and multi-parameter detection; and is expected to provide a rapid and effective detection method for bacteria. © 2020 John Wiley & Sons, Ltd.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1002/jrs.5857

✓ نام ژورنال:

Journal of Raman Spectroscopy

✓ سال انتشار:

2020

✓ کلیدواژه‌ها:

bacterial detection; SERS chip; silver nanoparticles

✓ **عنوان پژوهش:**

Correction: Antimicrobial peptide based magnetic recognition elements and Au@Ag-GO SERS tags with stable internal standards: A three in one biosensor for isolation, discrimination and killing of multiple bacteria in whole blood (Chemical Science (2018) DOI: 10.1039/c8sc04637a)

✓ **نویسندگان:**

Yuan K., Mei Q., Guo X., Xu Y., Yang D., Sánchez B.J., Sheng B., Liu C., Hu Z., Yu G., Ma H., Gao H., Haisch C., Niessner R., Jiang Z., Zhou H.

✓ **خلاصه پژوهش:**

The authors regret that the name of one of the authors, Zhengjin Jiang, was displayed incorrectly in the original article. The corrected author list is as shown above. The Royal Society of Chemistry apologises for these errors and any consequent inconvenience to authors and readers. © 2019 The Royal Society of Chemistry.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/c8sc90250j

✓ **نام ژورنال:**

Chemical Science

✓ **سال انتشار:**

2019

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

Surface-enhanced raman scattering from photoreduced Ag nanoaggregates on an optically trapped single bacterium

✓ **نویسندگان:**

Kitahama Y., Itoh T., Ishido T., Hirano K., Ishikawa M.

✓ **خلاصه پژوهش:**

A single bacterium in an aqueous Ag nitrate solution was optically trapped by focusing a near-infrared laser beam, and then Ag nanoaggregates were formed on the bacterium by focusing a green laser beam at the bacterium. We obtainedsurface-enhanced Raman scattering signals from a focal area on a single bacterium. © 2011 The Chemical Society of Japan.

✓ **لینک** DOI **(استفاده برای دانلود مقاله)**

10.1246/bcsj.20110102

✓ **نام ژورنال:**

Bulletin of the Chemical Society of Japan

✓ **سال انتشار:**

2011

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Surface-enhanced Raman spectroscopy for identification of food processing bacteria

✓ نویسندگان:

Kashif M., Majeed M.I., Nawaz H., Rashid N., Abubakar M., Ahmad S., Ali S., Hyat H., Bashir S., Batool F., Akbar S., Anwar M.A.

✓ خلاصه پژوهش:

Food processing bacteria play important role in providing flavors, ingredients and other beneficial characteristics to the food but at the same time some bacteria are responsible for food spoilage. Therefore, quick and reliable identification of these food processing bacteria is very necessary for the differentiation between different species which may help in the development of more useful food processing methodologies. In this study, analysis of different bacterial species (Lactobacillus fermentum, Fructobacillus fructosus, Pediococcus pentosaceus and Halalkalicoccus jeotgali) was performed with our in-house developed Ag NPs-based surface-enhanced Raman spectroscopy (SERS) method. The SERS spectral data was analyzed by multivariate data analysis techniques including principal component analysis (PCA) and partial least square discriminant analysis (PLS-DA). Bacterial species were differentiated on the basis of SERS spectral features and potential of SERS was compared with the Raman spectroscopy (RS). SERS along with PCA and PLS-DA was found to be an efficient technique for identification and differentiation of food processing bacterial species. Differentiation with accuracy of 99.5% and sensitivity of 99.7% was depicted by PLS-DA model using leave one out cross validation. © 2021 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.saa.2021.119989

✓ نام ژورنال:

Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy

✓ سال انتشار:

2021

✓ کلیدواژه‌ها:

Bacterial identification; Food processing; Partial least square discriminant analysis; Principal component analysis; Surface-enhanced Raman spectroscopy

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Surface enhanced Raman spectroscopy for bacteria analysis: a review

✓ **نویسندگان:**

Akanny E., Bonhommé A., Bessueille F., Bourgeois S., Bordes C.

✓ **خلاصه پژوهش:**

Surface Enhanced Raman spectroscopy (SERS) technique was developed to provide a high enhancement of Raman scattering from molecules adsorbed on nanostructured noble metal surfaces. This technique has gained tremendous interest in the past few years for the detection, identification and quantification of bacteria. Indeed, compared to the standard methods based on bacteria culture, SERS has many advantages in particular in terms of analysis time, sensitivity and sample preparation. The aim of this review is to provide an overview and a discussion of the SERS methods developed for bacteria analysis over the last 20 years. To well assess the technical issues of such developments, this literature review is presented after having described the physical and chemical phenomena involved in the Raman scattering enhancement as well as the different types of noble metal substrates that can be used. © 2020 Taylor & Francis Group, LLC.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1080/05704928.2020.1796698

✓ **نام ژورنال:**

Applied Spectroscopy Reviews

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

bacteria detection; bacteria quantification; Raman spectroscopy; SERS; SERS substrates

✓ **عنوان پژوهش:**

Rapid label-free SERS detection of foodborne pathogenic bacteria based on hafnium ditelluride-Au nanocomposites

✓ **نویسندگان:**

Li Y., Guo Y., Ye B., Zhuang Z., Lan P., Zhang Y., Zhong H., Liu H., Guo Z., Liu Z.

✓ **خلاصه پژوهش:**

Two-dimensional (2D) nanomaterials have captured an increasing attention in biophotonics owing to their excellent optical features. Herein, 2D hafnium ditelluride (HfTe2), a new member of transition metal tellurides, is exploited to support gold nanoparticles fabricating HfTe2-Au nanocomposites. The nanohybrids can serve as novel 2D surface-enhanced Raman scattering (SERS) substrate for the label-free detection of analyte with high sensitivity and reproducibility. Chemical mechanism originated from HfTe2 nanosheets and the electromagnetic enhancement induced by the hot spots on the nanohybrids may largely contribute to the superior SERS effect of HfTe2-Au nanocomposites. Finally, HfTe2-Au nanocomposites are utilized for the label-free SERS analysis of foodborne pathogenic bacteria, which realize the rapid and ultrasensitive Raman test of Escherichia coli, Listeria monocytogenes, Staphylococcus aureus and Salmonella with the limit of detection of 10 CFU/mL and the maximum Raman enhancement factor up to 1.7×108. Combined with principal component analysis, HfTe2-Au-based SERS analysis also completes the bacterial classification without extra treatment. © 2020 The Author(s).

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1142/S1793545820410047

✓ **نام ژورنال:**

Journal of Innovative Optical Health Sciences

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

foodborne pathogenic bacteria; hafnium ditelluride; surface-enhanced Raman scattering; Two-dimensional nanomaterials

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Synthesis and SERS application of gold and iron oxide functionalized bacterial cellulose nanocrystals (Au@Fe3O4@BCNCs)

✓ نویسندگان:

Kang S., Rahman A., Boeding E., Vikesland P.J.

✓ خلاصه پژوهش:

Bacterial cellulose nanocrystals (BCNCs) are biocompatible cellulose nanomaterials that can host guest nanoparticles to form hybrid nanocomposites with a wide range of applications. Herein, we report the synthesis of a hybrid nanocomposite that consists of plasmonic gold nanoparticles (AuNPs) and superparamagnetic iron oxide (Fe3O4) nanoparticles supported on BCNCs. As a proof of concept, the hybrid nanocomposites were employed to isolate and detect malachite green isothiocyanate (MGITC) via magnetic separation and surface-enhanced Raman scattering (SERS). Different initial gold precursor (Au3+) concentrations altered the size and morphology of the AuNPs formed on the nanocomposites. The use of 5 and 10 mM Au3+ led to a heterogenous mix of spherical and nanoplate AuNPs with increased SERS enhancements, as compared to the more uniform AuNPs formed using 1 mM Au3+. Rapid and sensitive detection of MGITC at concentrations as low as 10-10 M was achieved. The SERS intensity of the normalized Raman peak at 1175 cm-1 exhibited a log-linear relationship for MGITC concentrations between 2 × 10-10 and 2 × 10-5 M for Au@Fe3O4@BCNCs. These results suggest the potential of these hybrid nanocomposites for application in a broad range of analyte detection strategies. © 2020 The Royal Society of Chemistry.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1039/d0an00711k

✓ نام ژورنال:

Analyst

✓ سال انتشار:

2020

✓ کلیدواژه‌ها:

TEKSAN Detect Precisely

✓ عنوان پژوهش:

On the origin of electrochemical surface-enhanced Raman spectroscopy (EC-SERS) signals for bacterial samples: The importance of filtered control studies in the development of new bacterial screening platforms

✓ نویسندگان:

McLeod K.E.R., Lynk T.P., Sit C.S., Brosseau C.L.

✓ خلاصه پژوهش:

The field of point-of-need (PON) screening is currently lacking a rapid, sensitive and cost-effective method for bacterial detection. Such a method would prove invaluable for the efficient identification of pathogenic bacteria that result in a host of human infections and plague the healthcare sector. Surface-enhanced Raman spectroscopy (SERS) has increasingly been put forward as a viable candidate for a bacterial detection and identification platform due to its excellent sensitivity and the corresponding rich vibrational signature. Recently, there has been significant debate within the SERS community as to the origin of the observed SERS signals for cultured bacterial samples. This uncertainty stems from the remarkable similarity among many of the observed SERS signals for a vast array of bacteria, suggesting the spectral features may have a common origin. Electrochemical surface-enhanced Raman spectroscopy (EC-SERS) has recently been shown to largely improve upon the sensitivity of SERS for detection of bacteria. In this report, we will highlight the importance of conducting control studies using filtered bacterial samples. Using a 0.2 μm syringe filter to remove all bacterial cells from the examined sample, which is confirmed via scanning electron microscopy, this study demonstrates an excellent control for determining the origin of the bacterial signal in EC-SERS measurements. Our findings strongly support the argument that SERS spectra observed for bacterial cultures originate from small molecule metabolites released by the bacteria in response to environmental stressors. © 2019 The Royal Society of Chemistry.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1039/c8ay02613k

✓ نام ژورنال:

Analytical Methods

✓ سال انتشار:

2019

✓ کلیدواژه‌ها:

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Dual purpose fibre-SERS pH sensing and bacterial analysis

✓ **نویسندگان:**

Fleming H., McAughtrie S., Mills B., Tanner M.G., Marks A., Campbell C.J.

✓ **خلاصه پژوهش:**

The exploitation of fibre based Raman probes has been challenged by often complicated fabrication procedures and difficulties in reproducibility. Here, we have demonstrated a simple and cost-effective approach for sensing pH through an optical fibre, by employing a wax patterned filter paper-based substrate for surface enhanced Raman spectroscopy (SERS). Through this method, high reproducibility between fibres was achieved. In addition to sensing pH, it was possible to extract fluid samples containing P. aeruginosa for further analysis. This dual purpose fibre is bronchoscope deployable, and is able to gather information about both the host and pathogen, which may lead to an improved treatment plan in future in vivo applications. © The Royal Society of Chemistry.

✓ **لینک** DOI **(استفاده برای دانلود مقاله)**

10.1039/c8an01322e

✓ **نام ژورنال:**

Analyst

✓ **سال انتشار:**

2018

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

Fabricating a Long-Range Ordered 3D Bimetallic Nanoassembly with Edge-On Substrate for Highly Sensitive SERS Sensing of Escherichia coli Bacteria

✓ **نویسندگان:**

Jia H.W., Wang W.Q., Qiu L., Zhang N.N., Ge H.H., Wang J.

✓ **خلاصه پژوهش:**

Long-range ordered three-dimensional (3D) nanoassembly of bimetallic nanorods has been fabricated on coffee ring formed on the silicon substrate. Two kinds of arrangements, i.e., axial alignment of the nanorods perpendicular and parallel to the substrate, can be observed in the nanoassembly. Moreover, facet blocking of the nanorods can efficiently yield 3D nanoassembly with edge-on substrate. The long-range ordered 3D nanoassembly with edge-on substrate can provide highly reproducible and significant Raman-enhanced signal in contrast with random aggregated substrate. The representative vibrational band of Escherichia coli bacteria could be efficiently amplified by aid of the substrate due to strong field enhancement effects arising from the superstructure. Furthermore, vancomycin-coated nanoassembly with edge-on substrate as a robust nanosensor can efficiently capture E. coli bacteria and improve stability of the nanosensor for assay of E. coli bacteria. © 2015, Springer Science+Business Media New York.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1007/s11468-015-0012-5

✓ **نام ژورنال:**

Plasmonics

✓ **سال انتشار:**

2015

✓ **کلیدواژه‌ها:**

Assembly; Bimetallic nanorods; E. coli bacteria; SERS

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Characterization of bacterial NMN deamidase as a Ser/Lys hydrolase expands diversity of serine amidohydrolases

✓ **نویسندگان:**

Sorci L., Brunetti L., Cialabrini L., Mazzola F., Kazanov M.D., D'Auria S., Ruggieri S., Raffaelli N.

✓ **خلاصه پژوهش:**

NMN deamidase (PncC) is a bacterial enzyme involved in NAD biosynthesis. We have previously demonstrated that PncC is structurally distinct from other known amidohydrolases. Here, we extended PncC characterization by mutating all potential catalytic residues and assessing their individual roles in catalysis through kinetic analyses. Inspection of these residues' spatial arrangement in the active site, allowed us to conclude that PncC is a serine-amidohydrolase, employing a Ser/Lys dyad for catalysis. Analysis of the PncC structure in complex with a modeled NMN substrate supported our conclusion, and enabled us to propose the catalytic mechanism. © 2014 Federation of European Biochemical Societies. Published by Elsevier B.V. All rights reserved.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.febslet.2014.01.063

✓ **نام ژورنال:**

FEBS Letters

✓ **سال انتشار:**

2014

✓ **کلیدواژه‌ها:**

Amidohydrolase; Catalytic dyad; NMN deamidase; Pyridine nucleotide; Site-directed mutagenesis

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

First structural glimpse at a bacterial Ser/Thr protein phosphatase

✓ **نویسندگان:**

Alzari P.M.

✓ **خلاصه پژوهش:**

In this issue of Structure, Pullen et al. (2004) describe the crystal structure of the Ser/Thr protein phosphatase PstP from Mycobacterium tuberculosis, opening new perspectives to understand the putative roles of "eukaryotic-like" signaling elements in bacteria.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1016/j.str.2004.10.003

✓ **نام ژورنال:**

Structure

✓ **سال انتشار:**

2004

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

SERS Sensing of Bacterial Endotoxin on Gold Nanoparticles

✓ **نویسندگان:**

Verde A., Mangini M., Managò S., Tramontano C., Rea I., Boraschi D., Italiani P., De Luca A.C.

✓ **خلاصه پژوهش:**

Engineered gold nanoparticles (AuNPs) find application in several fields related to human activities (i.e., food and cosmetic industry or water purification) including medicine, where they are employed for diagnosis, drug delivery and cancer therapy. As for any material/reagent for human use, the safety of AuNPs needs accurate evaluation. AuNPs are prone to contamination by bacterial endotoxin (lipopolysaccharide, LPS), a potent elicitor of inflammatory responses in mammals. It is therefore important, when assessing AuNP immunosafety and immune-related effects, to discriminate between inflammatory effects intrinsic to the NPs from those caused by an undeliberate and undetected LPS contamination. Detection of LPS contamination in AuNP preparations poses different problems when using the current LPS detection assays, given the general interference of NPs, similar to other particulate agents, with the assay reagents and endpoints. This leads to time-consuming search for optimal assay conditions for every NP batch, with unpredictable results, and to the use in parallel of different assays, each with its weaknesses and unpredictability. Thus, the development of highly sensitive, quantitative and accurate assays able to detect of LPS on AuNPs is very important, in view of their medical applications. Surface-enhanced Raman spectroscopy (SERS) is a label-free, sensitive, chemical-specific, nondestructive and fast technique that can be used to directly obtain molecular fingerprint information and a quantitative analysis of LPS adsorbed on AuNPs. Within this study, we describe the use of SERS for the label-free identification and quantitative evaluation - down to few attograms - of the LPS adsorbed on the surface of 50 nm AuNPs. We thus propose SERS as an efficient tool to detect LPS on the AuNP surface, and as the basis for the development of a new sensitive and specific LPS-detection sensor based on the use of AuNPs and SERS. © Copyright © 2021 Verde, Mangini, Managò, Tramontano, Rea, Boraschi, Italiani and De Luca.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.3389/fimmu.2021.758410

✓ **نام ژورنال:**

Frontiers in Immunology

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

biosensor; gold nanoparticles; inflammation; innate immunity; LPS; SERS

✓ **عنوان پژوهش:**

A Negatively Charged Hydrophobic Hemi-micelle of Fe3O4/Ag MNP Role Towards SERS, Photocatalysis and Bactericidal

✓ **نویسندگان:**

Aarthi A., Umadevi M., Parimaladevi R., Sathe G.V., Arumugam S., Sivaprakash P.

✓ **خلاصه پژوهش:**

Surface enhanced Raman scattering (SERS), photocatalytic and antibacterial activities of Fe3O4/Ag magnetic nano particle (MNP) is reported in this work. A synthesized Fe3O4/Ag MNP is characterized with UV–visible, vibrational spectral studies (FT-IR), X-ray diffraction (XRD), vibrating sample magnetometer (VSM) and transmission electron microscopy (TEM). VSM reports Fe3O4/Ag MNP posses good magnetic response and attribute as a SERS substrate. SERS property of Fe3O4/Ag MNP has studied with 10–8 M, 10–10 M and 10–12 M concentrations of R6G. Photocatalytic efficiency was calculated with both R6G and environmentally ignored real (leachate) sample. The degradation takes place with rate constant ˷ 0.012 min−1. Moreover, degradation efficiency of Ag NPs has improved with Fe3O4 NPs. Also, as synthesized substrate shows an antibacterial activity against gram negative and gram positive bacteria with an inhibition zone of 5–8 mm. Both photonic and antibacterial properties make this material as promise for potential applications in environmental pollution, human medicine and contaminated drinking water. Graphic Abstract: [Figure not available: see fulltext.] © 2020, Springer Science+Business Media, LLC, part of Springer Nature.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1007/s10904-020-01802-4

✓ **نام ژورنال:**

Journal of Inorganic and Organometallic Polymers and Materials

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

Antibacterial activity; Fe3O4 Ag MNP; Photocatalysis; R6G; SERS

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Combined negative dielectrophoresis with a flexible SERS platform as a novel strategy for rapid detection and identification of bacteria

✓ نویسندگان:

Nowicka A.B., Czaplicka M., Szymborski T., Kamińska A.

✓ خلاصه پژوهش:

Surface-enhanced Raman spectroscopy (SERS) is a vibrational method successfully applied in analytical chemistry, molecular biology and medical diagnostics. In this article, we demonstrate the combination of the negative dielectrophoretic (nDEP) phenomenon and a flexible surface-enhanced Raman platform for quick isolation (3 min), concentration and label-free identification of bacteria. The platform ensures a strong enhancement factor, high stability and reproducibility for the SERS response of analyzed samples. By introducing radial dielectrophoretic forces directed at the SERS platform, we can efficiently execute bacterial cell separation, concentration and deposition onto the SERS-active surface, which simultaneously works as a counter electrode and thus enables such hybrid DEP-SERS device vibration-based detection. Additionally, we show the ability of our DEP-SERS system to perform rapid, cultivation-free, direct detection of bacteria in urine and apple juice samples. The device provides new opportunities for the detection of pathogens. Graphical abstract: [Figure not available: see fulltext.]. © 2021, Springer-Verlag GmbH Germany, part of Springer Nature.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1007/s00216-021-03169-y

✓ نام ژورنال:

Analytical and Bioanalytical Chemistry

✓ سال انتشار:

2021

✓ کلیدواژه‌ها:

Dielectrophoresis; Escherichia coli; Flexible SERS platform; SERS; Surface-enhanced Raman spectroscopy; Urine

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Surface enhanced Raman scattering of bacteria using capped and uncapped silver nanoparticles

✓ **نویسندگان:**

Mosier-Boss P.A., Sorensen K.C., George R.D., Sims P.C., Obraztsova A.

✓ **خلاصه پژوهش:**

Surface enhanced Raman scattering (SERS) spectra of bacteria were obtained using citrate (capped) and borohydride (uncapped) generated silver nanoparticles (Ag NPs).The observed differences in SERS spectra are attributed to the manner in which these Ag NPs interact with bacteria. Capped Ag NPs are able to partition through the surface polysaccharides of the bacterial cell to bind to the inner and outer cell membranes, as well as the periplasmic space between them. The resultant spectra show contributions due to the components of the cell envelope and cellular secretions. Uncapped Ag NPs are unable to partition through the polysaccharide outer structures of the cells. Spectral features observed for these uncapped Ag NPs are secretions primarily due to the metabolites of purine degradation. © 2020 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.saa.2020.118742

✓ **نام ژورنال:**

Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

Bacteria; Borohydride; Citrate; Secretions; Surface enhanced Raman scattering (SERS)

✓ **عنوان پژوهش:**

Simultaneous quantification of multiple bacterial metabolites using surface-enhanced Raman scattering

✓ **نویسندگان:**

Morelli L., Centorbi F.A., Ilchenko O., Jendresen C.B., Demarchi D., Nielsen A.T., Zór K., Boisen A.

✓ **خلاصه پژوهش:**

Given the commercial importance of the compounds produced by genetically modified organisms, there is a need for screening methods which facilitate the evaluation of newly developed strains, especially during the phase of proof-of-concept development. We report a time-efficient analysis method for the screening of bacterial strains, which enables the detection of two structurally similar secondary bacterial metabolites. By combining liquid-liquid extraction and surface-enhanced Raman scattering we were able to quantify p-coumaric acid and cinnamic acid, produced by genetically modified E. coli from tyrosine and phenylalanine, respectively. With the simple sample pre-treatment method, and by applying a partial least squares data analysis method, we simultaneously detected the analytes from four E. coli strains cultured in the presence or absence of tyrosine and phenylalanine. © The Royal Society of Chemistry 2019.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/c8an02128g

✓ **نام ژورنال:**

Analyst

✓ **سال انتشار:**

2019

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

Characterization of the Action of Antibiotics and Essential Oils against Bacteria by Surface-Enhanced Raman Spectroscopy and Scanning Electron Microscopy

✓ **نویسندگان:**

Szöke-Nagy T., Porav A.S., Coman C., Cozar B.I., Dina N.E., Tripon C.

✓ **خلاصه پژوهش:**

The description of the main structural alterations generated by the interaction between pathogenic microorganisms and antibiotic agents, either standard antibiotics or volatile plant derived oils, is an essential topic in understanding drug action mechanisms at the molecular level. To investigate this effect, an original approach based on ultrasensitive vibrational surface-enhanced Raman spectroscopy (SERS) and scanning electron microscopy (SEM) was used. Single-bacteria SERS spectra, recorded in the 600–1800 cm −1 wavenumber interval are reported for two bacterial strains: Enterococcus durans and Aeromonas media. Spectra-structure correlations for all types of localized vibrations, including bands assigned to proteins, saturated lipids, glycosidic linkages, and nitrogenous bases, are also discussed. SEM images revealed that the mechanism of action of antibiotic agents against the pathogenic microorganisms involves a complete denaturation of the bacterial membrane, which induces bacterial cells apoptosis. © 2018, © 2018 Taylor & Francis.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1080/00032719.2018.1430150

✓ **نام ژورنال:**

Analytical Letters

✓ **سال انتشار:**

2019

✓ **کلیدواژه‌ها:**

Antibiotics; bacterial strains; essential oils; inhibition; scanning electron microscopy; structure; surface-enhanced Raman spectroscopy

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

A novel surface-enhanced Raman scattering (SERS) detection for natural gas exploration using methane-oxidizing bacteria

✓ نویسندگان:

Liang W., Chen Q., Peng F., Shen A., Hu J.

✓ خلاصه پژوهش:

Methane-oxidizing bacteria (MOB), a unique group of Gram-negative bacteria utilizing methane as a sole source of carbon and energy, have been proved to be a biological indicator for gas prospecting. Field and cultivation-free detection of MOB is important but still challenging in current microbial prospecting of oil and gas (MPOG) system. Herein, SERS was used for the first time to our knowledge to investigate two species of methanotrophs and four closely relevant bacteria that universally coexisted in the upper soil of natural gas. A special but very simple approach was utilized to make silver nanoparticles (Ag NPs) sufficiently contact with every single bacterial cell, and highly strong and distinct Raman signals free from any native fluorescence have been obtained, and successfully utilized for distinguishing MOB from other species. A more convincing multi-Raman criterion based on single Raman bands, and further the entire Raman spectrum in combination with statistical analysis (e.g., principal component analysis (PCA)), which were found capable of classifying MOB related bacterial cells in soil with an accuracy of 100%. This study therefore demonstrated sensitive and rapid SERS measurement technique accompanied by complete Raman database of various gas reservoirs related bacteria could aid field exploration of natural gas reservoir. © 2018 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.talanta.2018.02.099

✓ نام ژورنال:

Talanta

✓ سال انتشار:

2018

✓ کلیدواژه‌ها:

Bacterial distinction; MOB; Natural gas prospection; PCA; SERS

✓ عنوان پژوهش:

Nanoparticle Surface-Enhanced Raman Scattering of Bacteriorhodopsin Stabilized by Amphipol A8-35

✓ نویسندگان:

Polovinkin V., Balandin T., Volkov O., Round E., Borshchevskiy V., Utrobin P., von Stetten D., Royant A., Willbold D., Arzumanyan G., Chupin V., Popot J.-L., Gordeliy V.

✓ خلاصه پژوهش:

Surface-enhanced Raman spectroscopy (SERS) has developed dramatically since its discovery in the 1970s, because of its power as an analytical tool for selective sensing of molecules adsorbed onto noble metal nanoparticles (NPs) and nanostructures, including at the single-molecule (SM) level. Despite the high importance of membrane proteins (MPs), SERS application to MPs has not really been studied, due to the great handling difficulties resulting from the amphiphilic nature of MPs. The ability of amphipols (APols) to trap MPs and keep them soluble, stable, and functional opens up onto highly interesting applications for SERS studies, possibly at the SM level. This seems to be feasible since single APol-trapped MPs can fit into gaps between noble metal NPs, or in other gap-containing SERS substrates, whereby the enhancement of Raman scattering signal may be sufficient for SM sensitivity. The goal of the present study is to give a proof of concept of SERS with APol-stabilized MPs, using bacteriorhodopsin (BR) as a model. BR trapped by APol A8-35 remains functional even after partial drying at a low humidity. A dried mixture of silver Lee–Meisel colloid NPs and BR/A8-35 complexes give rise to SERS with an average enhancement factor in excess of 102. SERS spectra resemble non-SERS spectra of a dried sample of BR/APol complexes. © 2014, Springer Science+Business Media New York.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1007/s00232-014-9701-9

✓ نام ژورنال:

Journal of Membrane Biology

✓ سال انتشار:

2014

✓ کلیدواژه‌ها:

Amphipol; Bacteriorhodopsin; Membrane protein; SERS spectroscopy; Silver nanoparticles

✓ **عنوان پژوهش:**

Combining vancomycin-modified gold nanorod arrays and colloidal nanoparticles as a sandwich model for the discrimination of Gram-positive bacteria and their detection: Via surface-enhanced Raman spectroscopy (SERS)

✓ **نویسندگان:**

Norouz Dizaji A., Simsek Ozek N., Aysin F., Calis A., Yilmaz A., Yilmaz M.

✓ **خلاصه پژوهش:**

This study reports the development of a highly sensitive antibiotic-based discrimination and sensor platform for the detection of Gram-positive bacteria through surface-enhanced Raman spectroscopy (SERS). Herein, a combination of gold nanorod arrays (GNAs) and colloidal gold nanoparticles (AuNPs) was used as a SERS platform. To specifically capture Gram-positive bacteria, both GNAs and AuNPs were functionalized with thiol-modified vancomycin (HS-Van) molecules. Three different strains of bacteria (Bacillus subtilis and Staphylococcus aureus as Gram-positive, and Escherichia coli as Gram-negative) were employed to test the proposed system. HS-Van functionalized GNAs (GNA@Van) captured Gram-positive bacteria with high specificity. Also, the bacteria captured by GNA@Van (GNA@Van@Bct) systems showed high signal-to-noise SERS signals with high reproducibility. Addition of AuNP@Van to GNA@Van@Bct resulted in the emergence of a sandwich system (GNA@Van@Bct@Van@AuNP). This system led to a further enhanced SERS signal. The chemometric analysis of GNA@Van@Bct@Van@AuNP enabled the obvious discrimination and detection of Gram-positive bacteria. For comparison, we also tested a smooth gold surface with the same procedure and a similar trend was observed with lower SERS activity. © 2021 The Royal Society of Chemistry.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/d1an00321f

✓ **نام ژورنال:**

Analyst

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Graphene-based and surface-enhanced raman spectroscopy for monitoring the physio-chemical response of thermophilic bacterial spores to low temperatures exposure

✓ نویسندگان:

Camerlingo C., Di Meo G., Lepore M., Lisitskiy M., Poli A., Portaccio M., Romano I., Di Donato P.

✓ خلاصه پژوهش:

Monitoring the spore life cycle is one of the main issues in several fields including environmental control, sustainable ecosystems, food security, and healthcare systems. In this framework, the study of the living organism resistance to extreme conditions like those mimicking space environments is particularly interesting. The assessment of the local change of the pH level can be extremely useful for this purpose. An optical physiometer method based on the Raman response of the graphene, which is able to locally sense pH of a fluid on a micrometric scale, has been recently proposed. Due to the presence of π-bonds at the surface, the electronic doping of graphene is determined by the external conditions and can be electrochemically controlled or altered by the contact with an acid or alkaline fluid. The doping level affects the vibrational energies of the graphene that can be monitored by conventional Raman spectroscopy. In addition, Surface-Enhanced Raman Spectroscopy (SERS) can give direct information on the biochemical changes occurring in spore components. In this work, we propose the joint use of Graphene-Based Raman Spectroscopy (GbRS) and SERS for the monitoring of the response of spores to exposure to low temperatures down to 100 K. The spores of the thermophilic bacterium Parageobacillus thermantarcticus isolated from an active volcano of Antarctica (Mt. Melbourne) were investigated. These spores are particularly resistant to several stressing stimuli and able to adapt to extreme conditions like low temperatures, UV irradiation, and γ-rays exposure. The results obtained showed that the joint use of GbRS and SERS represents a valuable tool for monitoring the physio-chemical response of bacterial spores upon exposure to stressing stimuli. © 2020 by the authors. Licensee MDPI, Basel, Switzerland.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.3390/s20154150

✓ نام ژورنال:

Sensors (Switzerland)

✓ سال انتشار:

2020

✓ کلیدواژه‌ها:

Graphene-based pH-meter; SERS; Spore germination; Thermophilic bacteria

✓ **عنوان پژوهش:**

Hydraulically pressed silver nanowire-cotton fibers as an active platform for filtering and surface-enhanced Raman scattering detection of bacteria from fluid

✓ **نویسندگان:**

Ankudze B., Asare B., Goffart S., Koistinen A., Nuutinen T., Matikainen A., Andoh S.S., Roussey M., Pakkanen T.T.

✓ **خلاصه پژوهش:**

Silver and gold nanoparticles-decorated cotton fiber substrates constitute an important group of the simple, inexpensive and versatile platforms for a SERS-based detection of biomolecules. However, the fibrous cotton embedded with metal nanoparticles is yet to be explored as a filter-like substrate for isolation and detection of pathogens from fluid. In this study, we present a straightforward approach based on hydraulic pressing to make a silver nanowire-decorated cotton fibers substrate a realistic platform for effective filtering and detection of bacteria from urine. Silver nanowires were anchored on cotton fibers using an aminopropyltrimethoxysilane as a linker. The obtained silver nanowire-cotton fiber material was compressed with a hydraulic press to substantially reduce the free spaces between the individual fibers. As a proof-of-concept, the prepared substrate was employed to effectively filter Escherichia coli bacteria from phosphate-buffered saline solution and urine. The silver nanowire-cotton SERS substrate thus serves as a low-cost and active platform for an effective detection of bacteria from fluids. © 2019 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.apsusc.2019.02.067

✓ **نام ژورنال:**

Applied Surface Science

✓ **سال انتشار:**

2019

✓ **کلیدواژه‌ها:**

Bacteria; Cotton; Escherichia coli; Silver nanowire; Surface-enhanced Raman scattering

✓ **عنوان پژوهش:**

Assembly of bioconjugated rod-nanotags and multilayer plasmonic nanorod-array for ultrasensitive SERS detection of S. aureus bacteria

✓ **نویسندگان:**

Zhang A.W., Tao G.Q., Wang J.

✓ **خلاصه پژوهش:**

A highly-efficient bioconjugation protocol of bimetallic rod-nanotags interacted with bacterial anti-S. aureus-IgG has been firstly demonstrated. Controllable fabrication of multilayer plasmonic nanorod-array (MPNRA) can be successfully obtained by facet functionalization of nanorods stacked on an activated Si/SiO2 chip. Vancomycin coating of MPNRA is favorable to immobilize S. aureus bacteria via multiple hydrogen bonding interactions, i.e., peptidoglycan of the bacterial cell and carbonyl/amine groups of the vancomycin. Moreover, the bimetallic rod-nanotags can be assembled around MPNRA via a bacterial biointerface. Ultrasensitive SERS detection of S. aureus bacteria with limit-of-detection (LOD) can be achieved up to 17.8 cfu/mL via combination of rod-nanotag and multilayer plasmonic nanorod-array perpendicular a chip (MPNRA-perpendicular substrate), which could be ascribed to dual plasmonic enhancement from bioconjugated rod-nanotags aggregates and large-scaled plasmonic nanorod-array. © 2018, Springer Science+Business Media B.V., part of Springer Nature.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1007/s11051-018-4200-z

✓ **نام ژورنال:**

Journal of Nanoparticle Research

✓ **سال انتشار:**

2018

✓ **کلیدواژه‌ها:**

Bacteria; Biosensor; Multilayer array; Rod-nanotag; SERS

TEKSAN Detect Precisely

✓ عنوان پژوهش:

High-yield aqueous synthesis of multi-branched iron oxide core–gold shell nanoparticles: SERS substrate for immobilization and magnetic separation of bacteria

✓ نویسندگان:

Tamer U., Onay A., Ciftci H., Bozkurt A.G., Cetin D., Suludere Z., Hakkı Boyacı İ., Daniel P., Lagarde F., Yaacoub N., Greneche J.-M.

✓ خلاصه پژوهش:

The high product yield of multi-branched core–shell Fe3−xO4@Au magnetic nanoparticles was synthesized used as magnetic separation platform and surface-enhanced Raman scattering (SERS) substrates. The multi-branched magnetic nanoparticles were prepared by a seed-mediated growth approach using magnetic gold nanospheres as the seeds and subsequent reduction of metal salt with ascorbic acid in the presence of a stabilizing agent chitosan biopolymer and silver ions. The anisotropic growth of nanoparticles was observed in the presence of chitosan polymer matrix resulting in multi-branched nanoparticles with a diameter over 100 nm, and silver ions also play a crucial role on the growth of multi-branched nanoparticles. We propose the mechanism of the formation of multi-branched nanoparticles while the properties of nanoparticles embedded in chitosan matrix are discussed. The surface morphology of nanoparticles was characterized with transmission electron microscopy, scanning electron microscopy, ultraviolet visible spectroscopy (UV–Vis), X-ray diffraction, and fourier transform infrared spectroscopy and 57Fe Mössbauer spectrometry. Additionally, the magnetic properties of the nanoparticles were also examined. We also demonstrated that the synthesized Fe3−xO4@Au multi-branched nanoparticle is capable of targeted separation of pathogens from matrix and sensing as SERS substrates. © 2014, Springer Science+Business Media Dordrecht.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1007/s11051-014-2624-7

✓ نام ژورنال:

Journal of Nanoparticle Research

✓ سال انتشار:

2014

✓ کلیدواژه‌ها:

Chitosan; Magnetic separation of bacteria; Multi-branched iron core–gold shell; Nanobiotechnology; SERS substrate for immobilization

✓ **عنوان پژوهش:**

Label-free SERS for rapid species identification of Escherichia Coli, Listeria Monocytogenes, and Salmonella Typhimurium bacteria

✓ **نویسندگان:**

Liu Y., Chen Y.-R., Nou X., Kim M.S., Chao K.

✓ **خلاصه پژوهش:**

The need for rapid detection of foodborne bacteria has long been a hot topic for a wide range of individuals, from policy makers to manufacturers. The traditional method, nucleic acid-based polymerase chain reaction (PCR), and antibody-based biosensors have been developed as viable tools to identify the bacteria. Generally, these methods are labor-intensive and multistep procedures, and they also require species-specific antibodies-probe reagents. Colloidal silver surface-enhanced Raman scattering (SERS), as demonstrated here, could be an important alternative technique in the rapid and simultaneous screening of the presence of the three most common outbreak bacteria because the technique uses exclusive biomarkers, is label-free, and provides easy sampling.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

✓ **نام ژورنال:**

Spectroscopy (Santa Monica)

✓ **سال انتشار:**

2008

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Discrimination of waterborne pathogens, Cryptosporidium parvum oocysts and bacteria using surface-enhanced Raman spectroscopy coupled with principal component analysis and hierarchical clustering

✓ نویسندگان:

Arslan A.H., Ciloglu F.U., Yilmaz U., Simsek E., Aydin O.

✓ خلاصه پژوهش:

Waterborne pathogens (parasites, bacteria) are serious threats to human health. Cryptosporidium parvum is one of the protozoan parasites that can contaminate drinking water and lead to diarrhea in animals and humans. Rapid and reliable detection of these kinds of waterborne pathogens is highly essential. Yet, current detection techniques are limited for waterborne pathogens and time-consuming and have some major drawbacks. Therefore, rapid screening methods would play an important role in controlling the outbreaks of these pathogens. Here, we used label-free surface-enhanced Raman Spectroscopy (SERS) combined with multivariate analysis for the detection of C. parvum oocysts along with bacterial contaminants including, Escherichia coli, and Staphylococcus aureus. Silver nanoparticles (AgNPs) are used as SERS substrate and samples were prepared with simply mixed of concentrated AgNPs with microorganisms. Each species presented distinct SERS spectra. Principal component analysis (PCA) and hierarchical clustering were performed to discriminate C. parvum oocysts, E. coli, and S. aureus. PCA was used to visualize the dataset and extract significant spectral features. According to score plots in 3 dimensional PCA space, species formed distinct group. Furthermore, each species formed different clusters in hierarchical clustering. Our study indicates that SERS combined with multivariate analysis techniques can be utilized for the detection of C. parvum oocysts quickly. © 2021 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.saa.2021.120475

✓ نام ژورنال:

Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy

✓ سال انتشار:

2022

✓ کلیدواژه‌ها:

C. parvum; Hierarchical clustering; Label-free detection; Principal component analysis; Surface-enhanced Raman spectroscopy; Waterborne pathogen

✓ عنوان پژوهش:

Stabilizing Enzymes in Plasmonic Silk Film for Synergistic Therapy of In Situ SERS Identified Bacteria

✓ نویسندگان:

Liu Z., Li S., Yin Z., Zhu Z., Chen L., Tan W., Chen Z.

✓ خلاصه پژوهش:

Increasing antibiotic resistance becomes a serious threat to public health. Photothermal therapy (PTT) and antibacterial enzyme-based therapy are promising nonresistant strategies for efficiently killing drug-resistant bacteria. However, the poor thermostability of enzymes in PTT hinders their synergistic therapy. Herein, antibacterial glucose oxidase (GOx) is embedded in a Ag graphitic nanocapsule (Ag@G) arrayed silk film to fabricate a GOx-synergistic PTT system (named silk-GOx-Ag@G, SGA). The SGA system can stabilize GOx by a vitrification process through the restriction of hydrogen bond and rigid β-sheet, and keep the antibacterial activity in the hyperthermal PTT environment. Moreover, the arrayed Ag@G possesses excellent chemical stability due to the protection of graphitic shell, providing stable plasmonic effect for integrating PTT and surface enhanced Raman scattering (SERS) analysis even in the GOx-produced H2O2 environment. With in situ SERS identification of bacterial intrinsic signals in the mouse wound model, such SGA realizes superior synergistic antibacterial effect on the infected Escherichia coli, Staphylococcus aureus, and methicillin-resistant Staphylococcus aureus in vivo, while without causing significant biotoxicity. This system provides a therapeutic method with low resistance and in situ diagnosis capability for efficiently eliminating bacteria. © 2022 The Authors.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1002/advs.202104576

✓ نام ژورنال:

Advanced Science

✓ سال انتشار:

2022

✓ کلیدواژه‌ها:

enzyme stabilization; graphitic nanocapsule; SERS; silk film; synergistic therapy

✓ **عنوان پژوهش:**

Magnetically Enhanced Liquid SERS for Ultrasensitive Analysis of Bacterial and SARS-CoV-2 Biomarkers

✓ **نویسندگان:**

Ji Z., Zhang C., Ye Y., Ji J., Dong H., Forsberg E., Cheng X., He S.

✓ **خلاصه پژوهش:**

In this work, it is shown that surface-enhanced Raman scattering (SERS) measurements can be performed using liquid platforms to perform bioanalysis at sub-pM concentrations. Using magnetic enrichment with gold-coated magnetic nanoparticles, the high sensitivity was verified with nucleic acid and protein targets. The former was performed with a DNA fragment associated with the bacteria Staphylococcus aureus, and the latter using IgG antibody, a biomarker for COVID-19 screening. It is anticipated that this work will inspire studies on ultrasensitive SERS analyzers suitable for large-scale applications, which is particularly important for in vitro diagnostics and environmental studies. © Copyright © 2021 Ji, Zhang, Ye, Ji, Dong, Forsberg, Cheng and He.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.3389/fbioe.2021.735711

✓ **نام ژورنال:**

Frontiers in Bioengineering and Biotechnology

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

analysis; bacteria; COVID-19; SARS-CoV-2; SERS

✓ **عنوان پژوهش:**

Trends in the bacterial recognition patterns used in surface enhanced Raman spectroscopy

✓ **نویسندگان:**

Ahmad W., Wang J., Li H., Jiao T., Chen Q.

✓ **خلاصه پژوهش:**

The intrinsic sensitivity features of surface-enhanced Raman spectroscopy (SERS) have now been considerably applied for extracting bacterial vibrational levels information with high speed. The challenge is to standardize the sampling procedures to promptly acquire maximum chemical details about bacteria in complex biological environments with high sensitivity and reproducibility. In this study, the SERS bacterial preconcentration, amplification, and identification literature is overviewed and categorized as: i) the reported sample preparation, isolation, and amplification steps; ii) aptamer, antibody, antibiotics-based bacterial recognition layouts and iii) identification based on the secreted chemicals or the reported biomarkers. The study also highlights fundamental trends in Raman reporters, substrates, and label-free practices briefly, along with SERS imaging, limitations, and possible future prospects. Thus, the review aims to structure and organize the bacterial-SERS detection practices with systematic topical outlines to be applicable in the form of strategies and research in diverse disciplines. © 2021 Elsevier B.V.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1016/j.trac.2021.116310

✓ **نام ژورنال:**

TrAC - Trends in Analytical Chemistry

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

Amplification; Aptamer; Bacteria; Metabolites; Pretreatment; Sample preparation; SERS; Substrate

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Surface-Enhanced Raman Spectroscopy of Bacterial Metabolites for Bacterial Growth Monitoring and Diagnosis of Viral Infection

✓ **نویسندگان:**

Wang W., Kang S., Vikesland P.J.

✓ **خلاصه پژوهش:**

Bacterial metabolites are intermediate products of bacterial metabolism and their production reflects metabolic activity. Herein, we report the use of surface-enhanced Raman spectroscopy (SERS) for detection of both volatile and nonvolatile metabolites and the application of this approach for bacterial growth quantification and diagnosis of viral infection. The time-dependent SERS signal of the volatile metabolite dimethyl disulfide in the headspace above bacteria growing on an agar plate was detected and quantified. In addition, SERS signals arising from the plate reflected nutrient consumption and production of nonvolatile metabolites. The measurement of metabolite accumulation can be used for bacterial quantification. In the presence of bacteriophage virus, bacterial metabolism is suppressed, and the relative decrease in SERS intensity reflects the initial virus concentration. Using multivariate analysis, we detect viral infection with a prediction accuracy of 93%. Our SERS-based approach for metabolite production monitoring provides new insights toward viral infection diagnosis. © 2021 American Chemical Society

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1021/acs.est.1c02552

✓ **نام ژورنال:**

Environmental Science and Technology

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

bacteria; detection; metabolite; surface-enhanced Raman spectroscopy; virus

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

SERS biosensor based on engineered 2D-aperiodic nanostructure for in-situ detection of viable brucella bacterium in complex matrix

✓ **نویسندگان:**

Rippa M., Castagna R., Sagnelli D., Vestri A., Borriello G., Fusco G., Zhou J., Petti L.

✓ **خلاصه پژوهش:**

Brucella is a foodborne pathogen globally affecting both the economy and healthcare. Surface Enhanced Raman Spectroscopy (SERS) nano-biosensing can be a promising strategy for its detection. We combined high-performance quasi-crystal patterned nanocavities for Raman enhancement with the use of covalently immobilized Tbilisi bacteriophages as high-performing bio-receptors. We coupled our efficient SERS nano-biosensor to a Raman system to develop an on-field phage-based bio-sensing platform capable of monitoring the target bacteria. The developed biosensor allowed us to identify Brucella abortus in milk by our portable SERS device. Upon bacterial capture from samples (104 cells), a signal related to the pathogen recognition was observed, proving the concrete applicability of our system for on-site and in-food detection. © 2021 by the authors. Licensee MDPI, Basel, Switzerland.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.3390/nano11040886

✓ **نام ژورنال:**

Nanomaterials

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

Bacteria; Nano-biosensing; Nanocavities; Quasi-crystals; SERS

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Coencapsulation of Carbon Dots and Gold Nanoparticles over Escherichia coli for Bacterium Assay by Surface-Enhanced Raman Scattering

✓ نویسندگان:

León Anchustegui V.A., Zhu J., He L., Bi Y., Dong Y., Liu J.-H., Wang S.

✓ خلاصه پژوهش:

Carbon dots (C-dots) is a type of fluorescent nanomaterials with excellent properties, which in combination with gold nanoparticles (AuNPs) generate structures that can be applied in various fields of science. This research developed a hybrid nanostructure between C-dots and AuNPs using a layer-by-layer (LbL) assembly to increase the surface-enhanced Raman scattering signals (SERS) for the detection of Escherichia coli. The created nanostructure was denoted as B@C-dots@AuNPs and proved by zeta potential, scanning electron microscopy, and fluorescence assays. The results showed that the introduction of AuNPs greatly enhanced the SERS signals of C-dots. The relative intensities of peaks at 2873 and 3082 cm-1 could be used for the detection of bacterium concentration with a detection limit of ca. 102 cfu/mL. In conclusion, an easy, quick, low-cost, and nontoxic technique for the detection of bacteria was developed through the coencapsulation of C-dots and AuNPs over bacteria. The findings are envisaged to facilitate the application of SERS in microbiology and related fields. ©

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acsabm.0c01154

✓ نام ژورنال:

ACS Applied Bio Materials

✓ سال انتشار:

2021

✓ کلیدواژه‌ها:

bacteria; carbon dots; gold nanoparticles; layer-by-layer; surface-enhanced Raman scattering

✓ **عنوان پژوهش:**

Identification of Bacteria by Surface-Enhanced Raman Spectra after Peroxide Treatment

✓ **نویسندگان:**

Kopitsyn D.S., Gorbachevskii M.V., Botchkova E.A., Bychenko M.A., Novikov A.A.

✓ **خلاصه پژوهش:**

Abstract: Surface-enhanced Raman spectroscopy (SERS) is a prospective method for the detection and identification of microorganisms. Hereby we describe the method for the registration of bacterial SERS spectra, including the mild oxidation sample treatment for the additional amplification of SERS signal. We also propose the spectral data processing method for the calculation of distinguishing criteria for the bacterial spectra. © 2019, Pleiades Publishing, Inc.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1134/S0003683819010095

✓ **نام ژورنال:**

Applied Biochemistry and Microbiology

✓ **سال انتشار:**

2019

✓ **کلیدواژه‌ها:**

gold nanoparticles; identification of bacteria; principal component analysis; surface-enhanced Raman scattering

Detect Precisely

✓ **عنوان پژوهش**:

Nanocellulose Films: Bacterial Nanocellulose-Based Flexible Surface Enhanced Raman Scattering Substrate (Adv. Mater. Interfaces 15/2016)

✓ **نویسندگان**:

Tian L., Jiang Q., Liu K.-K., Luan J., Naik R.R., Singamaneni S.

✓ **خلاصه پژوهش**:

[No abstract available]

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1002/admi.201670073

✓ **نام ژورنال**:

Advanced Materials Interfaces

✓ **سال انتشار**:

2016

✓ **کلیدواژه‌ها**:

bacterial nanocellulose; flexible SERS substrates; gold nanorods; surface enhanced Raman scattering; swab

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

SERS-based CRISPR/Cas assay on microfluidic paper analytical devices for supersensitive detection of pathogenic bacteria in foods

✓ **نویسندگان:**

Zhuang J., Zhao Z., Lian K., Yin L., Wang J., Man S., Liu G., Ma L.

✓ **خلاصه پژوهش:**

Rapid and point-of-need (PON) detection of bacteria is crucial to directly provide rapid and reliable diagnostics information during on-site tests, allowing more room for taking proactive measures. By taking the multifaceted advantages of CRISPR/Cas12a and surface-enhanced Raman scattering (SERS), for the first time, we designed a recombinase polymerase amplification (RPA)-integrated microfluidic paper-based analytical device (μPAD), coined RPA-Cas12a-μPAD for supersensitive SERS detection. Single-stranded DNAs were designed to “pull down” SERS nanoprobes. The amplicons of the invA gene triggered the trans-cleavage of Cas12a, resulting in the indiscriminate shredding of linker ssDNA. Thus, the degree of aggregation of SERS nanoprobes was dependent on the concentration of Salmonella typhimurium (S. typhi), which was determined on a μPAD and monitored by a Raman spectrometer. The limit of detection for S. typhi was approximately 3–4 CFU/mL for spiked milk and meat samples with a dynamic detection range from 1 to 108 CFU/mL. The RPA-Cas12a-μPAD secured accurate tests for food samples in 45 min. This work expands the reach of CRISPR-based diagnostics (CRISPR-Dx) and provides a novel and robust bacterial PON detection platform. © 2022 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.bios.2022.114167

✓ **نام ژورنال:**

Biosensors and Bioelectronics

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

Bacterial detection; CRISPR/Cas; Food analysis; Microfluidic paper-based analytical device; Point-of-need; Surface-enhanced Raman scattering

✓ عنوان پژوهش:

Lectin-Modified Bacterial Cellulose Nanocrystals Decorated with Au Nanoparticles for Selective Detection of Bacteria Using Surface-Enhanced Raman Scattering Coupled with Machine Learning

✓ نویسندگان:

Rahman A., Kang S., Wang W., Huang Q., Kim I., Vikesland P.J.

✓ خلاصه پژوهش:

Bacterial cellulose nanocrystals (BCNCs) are tunable and biocompatible cellulose nanomaterials that can be easily bioconjugated and used for biosensing applications. We report the application of concanavalin A (con A) lectin-modified BCNCs (con A + BCNCs) for bacterial isolation and label-free surface-enhanced Raman spectroscopy (SERS) detection of bacterial species using Au nanoparticles (AuNPs). The aggregated AuNP + bacteria + (con A + BCNC) conjugates generated SERS hot spots that enabled the SERS detection of the strain Escherichia coli 8739 at the 103 CFU/mL level. The optimized detection assay was then used to differentiate 19 common bacterial strains. The large SERS spectral dataset for the 19 bacterial strains was analyzed using the support vector machine (SVM), an optimization-based machine-learning technique that worked as a binary classifier. The SVM classifier showed a high overall accuracy of 87.7% in correctly discriminating bacterial strains. This study illustrates the potential of combining low-cost nanocellulose-based SERS biosensors with machine-learning techniques for the analysis of large spectral datasets. © 2022 American Chemical Society

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acsanm.1c02760

✓ نام ژورنال:

ACS Applied Nano Materials

✓ سال انتشار:

2022

✓ کلیدواژه‌ها:

bacteria; cellulose; classification; lectin; support vector machine (SVM); surface-enhanced Raman scattering (SERS)

✓ عنوان پژوهش:

Understanding and Advancing the 3-mercaptophenylboronic Acid Chemical Label for Optimal Surface-enhanced Raman Spectroscopic Analysis of Bacteria Populations

✓ نویسندگان:

Hickey M.E., He L.

✓ خلاصه پژوهش:

3-mercaptophenylboronic acid (3-MPBA) was applied as a capturer and label for bacteria detection using surface-enhanced Raman spectroscopy (SERS). The objective of this study was to further understand and advance 3-MPBA as a SERS labeling chemical to study bacteria populations using SERS. We report that the coating of bacteria cells with 3-MPBA was very strong, with bacteria producing 3-MPBA SERS signals after five thorough rinse water applications. The procedure was also found to implement harm to bacterial ecology, and the trend was quantitatively different based on the initial cell population being labeled. SERS imaging by this approach measured all labeled bacteria cells, regardless of viability. Nonculturable cells are therefore detectable by this SERS approach. Nanoparticle administrations were optimal when bacteria cells were suspended in a liquid or applied to substrates which already possessed nanostructures. Circumstances in which dried bacteria cells were present upon a substrate prior to nanoparticle administrations warranted lower SERS signals in comparison. Bacteria were analyzed at the single-cell scale using this approach, and the data revealed that microscopic objective lenses and overall bacteria population influenced the SERS limit-of-detection in this respect. The information obtained from this study provides useful guidelines for advancing 3-MPBA labeling for the SERS analysis of bacteria. ©

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acsabm.0c01138

✓ نام ژورنال:

ACS Applied Bio Materials

✓ سال انتشار:

2020

✓ کلیدواژه‌ها:

bacteria; detection; imaging; mercaptophenylboronic acid; surface-enhanced Raman scattering

✓ **عنوان پژوهش:**

Role of bacterial Ser/Thr protein kinases spr 1577 in the pathogenesis of respiratory infections caused by S. pneumoniae

✓ **نویسندگان:**

Sun Y., Aljeldah M.M., Wang S.

✓ **خلاصه پژوهش:**

This study investigated the specific role played by conserved membrane eukaryotic-like Ser/Thr protein kinases (StkP) during infection, particularly pneumonia, in order to get deep insights about Ser/Thr protein kinases signaling during infection and pathogenesis. The wild type and mutated Ser/Thr protein kinases (Spr1577) strains were tested on different cell lines to understand their virulence based on gentamicin protection assay, gene expression analysis and the expression of various interleukins. Though there was no uptake of bacterial CFU at the beginning, after 24 h it was 50% less for the mutated in comparison to wild-type strain, thus indicating a possible role of Spr1577 gene in the phagosomal survival of S pneumoniae. The complemented, strain-restored bacterial survival to the similar extent alike wild-type strains suggest that the Spr1577 kinase activity is not critical for the intracellular survival of S. pneumoniae within macrophages. Peak expression of spr1577 post infection indicating that the virulent genes seemed persuaded within the macrophages. Higher induction of pro-inflammatory cytokines by the wild type and complemented strains, but not by mutated strain, suggest its role in the induction of macrophages functions. S. pneumoniae and S. pyogenes are closely-related pathogens having 97% similarity in their gene sequences suggesting that the virulence mechanisms greatly varies and remain poorly understood for S. pneumoniae. © 2020 Elsevier Ltd

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.micpath.2020.104065

✓ **نام ژورنال:**

Microbial Pathogenesis

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

er/Thr protein kinases; S. pneumoniae; spr1577; StkP signaling; Virulence mechanisms

✓ **عنوان پژوهش:**

Differential Diagnostics of Bacteria Using the Surface-Enhanced Raman Spectra

✓ **نویسندگان:**

Borisova O.V., Galstyan A.G., Olenin A.Y., Lisichkin G.V., Zverev V.V.

✓ **خلاصه پژوهش:**

Abstract—: Surface-enhanced Raman scattering of bioorganic compounds close to silver nanoparticles may be used for species identification of microbial colonies. The preparations of silver nanoparticles sol with a single microbial colony (strains Escherichia coli 376/2, Staphylococcus aureus 25923, Pseudomonas aeruginosa ATCC 27583, and Bacillus subtilis 534) exhibited the individual Raman spectra, in which the band occurrence and intensity correlated with the species composition. The most important differences in the spectra of these four strains were associated with the bands at 649–652, 948–950, 1326–1340, and 1468 cm−1. Application of the principal component analysis within the range from 600 to 1600 cm−1 resulted in the sum of the factor load of two major components equal to 83.53% of the total differences between the spectra and demonstrated the possibility of differential diagnostics of four microbial species. © 2020, Pleiades Publishing, Ltd.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1134/S002626172001004X

✓ **نام ژورنال:**

Microbiology (Russian Federation)

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

bacteria; silver nanoparticles; surface-enhance Raman scattering

✓ **عنوان پژوهش**:

Erratum to "Key structures of bacterial peptidoglycan and lipopolysaccharide triggering the innate immune system of higher animals: Chemical synthesis and functional studies" [Proc. Jpn. Acad., Ser. B 86, No. 4, 322-337]

✓ **نویسندگان**:

Kusumoto S., Fukase K., Shiba T.

✓ **خلاصه پژوهش**:

[No abstract available]

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.2183/pjab.86.538

✓ **نام ژورنال**:

Proceedings of the Japan Academy Series B: Physical and Biological Sciences

✓ **سال انتشار**:

2010

✓ **کلیدواژه‌ها**:

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

Boosting bacteria differentiation efficiency with multidimensional surface-enhanced Raman scattering: the example of Bacillus cereus

✓ **نویسندگان:**

Zhu C., Liu W., Wang D., Gong Z., Fan M.

✓ **خلاصه پژوهش:**

Surface-enhanced Raman scattering (SERS) is a powerful tool for constructing biomolecular fingerprints, which play a vital role in differentiation of bacteria. Due to the rather subtle differences in the SERS spectra among different bacteria, artificial intelligence is usually adopted and enormous amounts of spectral data are required to improve the differentiation efficiency. However, in many cases, large volume data acquisition on bacteria is not only technical difficult but labour intensive. It is known that surface modification of SERS nanomaterials can bring additional dimensionality (difference) of the SERS fingerprints. Here in this work, we show that the concept could be used to improve the bacteria differentiation efficiency. Ag NPs were modified with 11-mercaptoundecanoic acid, 11-mercapto-1-undecanol, and 1-dodecanethiol to provide additional dimensionality. The modified NPs then were mixed with cell lysate from different strains of Bacillus cereus (B. cereus). Even by applying a simple PCA process to the resulting SERS spectra data, all the three modified Ag NPs showed superior differentiation results compared with bare Ag NPs, which could only separate Staphylococcus aureus (S. aureus) and B. cereus. It is believed that the multidimensional SERS could find great potential in bacteria differentiation. © 2022 John Wiley & Sons Ltd.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/bio.4268

✓ **نام ژورنال:**

Luminescence

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

B. cereus; bacteria differentiation; multidimensional SERS; S. aureus; surface modification

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Early and direct detection of bacterial signaling molecules through one-pot Au electrodeposition onto paper-based 3D SERS substrates

✓ نویسندگان:

Kim S., Ansah I.B., Park J.S., Dang H., Choi N., Lee W.-C., Lee S.H., Jung H.S., Kim D.-H., Yoo S.M., Choo J., Kim S.-H., Park S.-G.

✓ خلاصه پژوهش:

The rapid detection of bacterial metabolites responsible for cell communication is important for the early diagnosis of bacterial infection and treatment with appropriate antibiotics. Surface-enhanced Raman spectroscopy (SERS) has provided amplified molecular fingerprints, serving as one of the most promising nondestructive and label-free direct detection methods. However, direct analysis of complex bacterial cultures using the conventional SERS approach is difficult. Here, we design a new paper-based 3D SERS substrate and establish a facile one-pot Au electrodeposition protocol to directly detect pyocyanin, a signaling molecule of Pseudomonas aeruginosa, secreted in the culture medium, without pretreatment steps. During one-pot Au electrodeposition in the presence of an Au precursor and culture medium, the bacterial pathogen molecule (i.e., pyocyanin) is captured in the interstitial voids of the 3D hydrogel matrix among growing Au grains, resulting in high amplification of the Raman signal intensity. Because the hydrogel skin excludes macromolecules (i.e., proteins) in the culture medium, thereby maintaining an uncontaminated surface, our approach achieves the direct and rapid detection of pyocyanin in a complex bacteria culture sample without any purification steps. Therefore, the pyocyanin concentration during bacterial culturing is easily and directly monitored, which is important for the early diagnosis of infection and in-depth studies of bacterial cell communication. © 2022

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.snb.2022.131504

✓ نام ژورنال:

Sensors and Actuators B: Chemical

✓ سال انتشار:

2022

✓ کلیدواژه‌ها:

Bacteria; Hydrogel; One-pot electrodeposition; Pyocyanin; Surface-enhanced Raman spectroscopy

✓ **عنوان پژوهش:**

Separation-free bacterial identification in arbitrary media via deep neural network-based SERS analysis

✓ **نویسندگان:**

Rho E., Kim M., Cho S.H., Choi B., Park H., Jang H., Jung Y.S., Jo S.

✓ **خلاصه پژوهش:**

Universal and fast bacterial detection technology is imperative for food safety analyses and diagnosis of infectious diseases. Although surface-enhanced Raman spectroscopy (SERS) has recently emerged as a powerful solution for detecting diverse microorganisms, its widespread application has been hampered by strong signals from surrounding media that overwhelm target signals and require time-consuming and tedious bacterial separation steps. By using SERS analysis boosted with a newly proposed deep learning model named dual-branch wide-kernel network (DualWKNet), a markedly simpler, faster, and effective route to classify signals of two common bacteria E. coli and S. epidermidis and their resident media without any separation procedures is demonstrated. With outstanding classification accuracies up to 98%, the synergistic combination of SERS and deep learning serves as an effective platform for “separation-free“ detection of bacteria in arbitrary media with short data acquisition times and small amounts of training data. © 2022 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.bios.2022.113991

✓ **نام ژورنال:**

Biosensors and Bioelectronics

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

Bacterial detection; Deep learning; E. coli; S. epidermidis; Surface-enhanced Raman spectroscopy

✓ **عنوان پژوهش:**

Differentiation of closely related oak-associated gram-negative bacteria by label-free surface enhanced raman spectroscopy (Sers)

✓ **نویسندگان:**

Vaitiekūnaitė D., Snitka V.

✓ **خلاصه پژوهش:**

Due to the harmful effects of chemical fertilizers and pesticides, the need for an eco-friendly solution to improve soil fertility has become a necessity, thus microbial biofertilizer research is on the rise. Plant endophytic bacteria inhabiting internal tissues represent a novel niche for research into new biofertilizer strains. However, the number of species and strains that need to be differentiated and identified to facilitate faster screening in future plant-bacteria interaction studies, is enormous. Surface enhanced Raman spectroscopy (SERS) may provide a platform for bacterial discrimination and identification, which, compared with the traditional methods, is relatively rapid, uncomplicated and ensures high specificity. In this study, we attempted to differentiate 18 bacterial isolates from two oaks via morphological, physiological, biochemical tests and SERS spectra analysis. Previous 16S rRNA gene fragment sequencing showed that three isolates belong to Paenibacillus, 3—to Pantoea and 12—to Pseudomonas genera. Additional tests were not able to further sort these bacteria into strain-specific groups. However, the obtained label-free SERS bacterial spectra along with the high-accuracy principal component (PCA) and discriminant function analyses (DFA) demonstrated the possibility to differentiate these bacteria into variant strains. Furthermore, we collected information about the biochemical characteristics of selected isolates. The results of this study suggest a promising application of SERS in combination with PCA/DFA as a rapid, non-expensive and sensitive method for the detection and identification of plant-associated bacteria. © 2021 by the authors. Licensee MDPI, Basel, Switzerland.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.3390/microorganisms9091969

✓ **نام ژورنال:**

Microorganisms

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

Discriminant function analysis; Label-free; Paenibacillus; Pantoea; Plant-associated bacteria; Principal component analysis; Pseudomonas; SERS; Surface enhanced Raman spectroscopy

✓ **عنوان پژوهش:**

Highly sensitive detection and differentiation of endotoxins derived from bacterial pathogens by surface-enhanced raman scattering

✓ **نویسندگان:**

Wu X., Zhao Y., Zughaier S.M.

✓ **خلاصه پژوهش:**

Bacterial endotoxins, as major components of Gram-negative bacterial outer membrane leaflets and a well-characterized TLR4-MD-2 ligand, are lipopolysaccharides (LPSs) that are constantly shed from bacteria during growth and infection. For the first time, we report that unique surface-enhanced Raman scattering (SERS) spectra of enteric LPSs from E. coli, S. typhimurium, S. minnesota, V. cholerae, Rhizobium species R. CE3, and R. NGR, as well as Neisseria meningitidis endotoxin structures, LPSs, lipid A, and KDO2-lipid A can be obtained. The characteristic peaks of the SERS spectra reveal that most of the tested LPS structures are from lipids and saccharides, i.e., the major components of LPSs, and these spectra can be successfully used to differentiate between endotoxins with principal components analysis. In addition, all the LPS samples here are measured at a concentration of 10 nmole/mL, which corresponds to their relevant pathophysiological concentrations in clinical infections. This study demonstrates that LPSs can be used as biomarkers for the highly sensitive detection of bacteria using SERS-based methods. © 2021 by the authors. Licensee MDPI, Basel, Switzerland.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.3390/bios11070234

✓ **نام ژورنال:**

Biosensors

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

Bacteria; Endotoxin; Lipid A; LPS; SERS; Silver nanorods

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

SERS imaging analyses of bacteria cells among plant tissues

✓ **نویسندگان:**

Hickey M.E., He L.

✓ **خلاصه پژوهش:**

A chemical imaging method to mass surveil bacteria cells among plant tissues in situ is reported. Bacteria cells were pre-labeled with 3-mercaptophenylboronic acid for complexation with gold nanoparticles. Surface-enhanced Raman spectra were collated en masse to generate panoramic chemical images of bacteria populations. The approach was successfully employed to study the distribution of mass bacteria populations directly on and in selected plant tissues. This study demonstrates the great potential with which SERS imaging can be utilized for the study of bacterial cells among complex matrices, in some ways that are superior to electron and fluorescent microscopies. © 2020 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.talanta.2020.122008

✓ **نام ژورنال:**

Talanta

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

Bacteria; Imaging; In situ; Plant tissues; Raman microscopy; SERS

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

Precisely Controlled Three-Dimensional Gold Nanoparticle Assembly Based on Spherical Bacteriophage Scaffold for Molecular Sensing via Surface-Enhanced Raman Scattering

✓ **نویسندگان:**

Jeon M.J., Ma X., Lee J.U., Roh H., Bagot C.C., Park W., Sim S.J.

✓ **خلاصه پژوهش:**

Surface-enhanced Raman scattering (SERS) induced from nanostructured noble metals has a great potential for molecular detection and analysis. However, it has been a challenge to fabricate a reliable SERS-active nanostructure that produces highly sensitive signal response with high fidelity for use in the practical sensing platform. Here, a bacteriophage MS2 with highly regular structure was introduced as a molecular scaffold to assemble nanoparticles into a dense and reproducible three-dimensional raspberry-shaped nanostructure. The nanoraspberry features evenly distributed electromagnetic hot spots responsible for single-molecule-level analysis of SERS-based sensing. By selecting a rigid molecular linker, as well as MS2 phage, the gold nanoparticles were able to be assembled into nanoraspberry superstructures with precisely defined positions, producing strong electric near-field enhancement between nanometer-sized interparticle gaps. The numerical simulation and experimental measurement demonstrated that the nanoraspberry structure produces strong SERS signal amplification, with remarkable intra- and interbatch signal uniformity, proving that structural reproducibility originated from rigid building blocks can lead to a reliable SERS measurement for molecular sensing and analysis applications. © 2021 American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acs.jpcc.0c08800

✓ **نام ژورنال:**

Journal of Physical Chemistry C

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Salmonella ser. Typhimurium bacteremia related hemophagocytic lymphohistiocytosis: A case report [Salmonella ser. Typhimurium bakteremisi ile ilişkili hemofagositik lenfohistiyositoz: bir olgu sunumu]

✓ **نویسندگان:**

Yaşar Durmuş S., Tanır G., Öz F.N., Aydın Teke T., Kaman A.

✓ **خلاصه پژوهش:**

Salmonella enterica Serovar Typhimurium (Salmonella ser. Typhimurium) may cause invasive non-typhoidal Salmonella infections. Being a facul-tative intracellular bacteria, they are found within diversity of cells like as macrophages and manipulate these cells for erythrophagocytosis. Here, we report a 9-year-old boy who had Salmonella ser. Typhimurium bacte-remia related hemophagocytic lymphohistiocytosis. © 2020 by Pediatric Infectious Diseases and Immunization Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.5578/ced.68699

✓ **نام ژورنال:**

Cocuk Enfeksiyon Dergisi

✓ **سال انتشار:**

2020

✓ **کلیدواژه‌ها:**

Bacteremia; Hemophagocytic lymphohistiocytosis; Salmonella ser. Typhimurium

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Detection of mixed bacterial populations by surface enhanced Raman scattering (SERS)spectroscopy

✓ **نویسندگان**:

Martinez L.A., Spano J.L., Bird T.E., Simecek J.W., Mallory A., Stahl J.M.

✓ **خلاصه پژوهش**:

[No abstract available]

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1016/j.sbsr.2019.100282

✓ **نام ژورنال**:

Sensing and Bio-Sensing Research

✓ **سال انتشار**:

2019

✓ **کلیدواژه‌ها**:

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Reduced graphene oxide nanosheets decorated with core-shell of Fe3O4-Au nanoparticles for rapid SERS detection and hyperthermia treatment of bacteria

✓ نویسندگان:

Yang M.-C., Hardiansyah A., Cheng Y.-W., Liao H.-L., Wang K.-S., Randy A., Harito C., Chen J.-S., Jeng R.-J., Liu T.-Y.

✓ خلاصه پژوهش:

In this study, the core–shell of Fe3O4-Au nanoparticles (NPs) were prepared by seeding AuNPs onto Fe3O4 NPs modified with poly-ethylenimine (PEI). Later, Fe3O4-Au NPs were attached to cationic poly(dimethyldiallylammonium chloride) (PDDA)-modified graphene oxide (GO) nanosheets through in situ self-assembly behaviors, termed as Fe3O4-Au@RGO nanocomposites, for surface-enhanced Raman scattering (SERS) detection and hyperthermia treatment of bacteria. The resulting Fe3O4-Au@RGO nanocomposites were evaluated systematically by transmission electron microscope, zeta potential, X-ray diffraction, X-ray photoelectron spectroscopy, and vibrating sample magnetometer. It revealed that the core–shell structured Fe3O4-Au NPs were dispersed homogeneously on the surface of the GO nanosheets. Furthermore, the rapid SERS detection for small biomolecules and bacteria was conducted by Raman spectroscopy. The results showed that the greatest SERS intensity was fne tuned at the weight ratio of Fe3O4-Au/RGO nanosheets was 20/1, displaying the optimal interparticle gap of AuNPs to induce the huge hot-spots effect. The magnetic inductive heating capability of Fe3O4-Au@RGO nanocomposites was produced under high frequency magnetic field exposure and can kill high than 90% of the bacteria at 10 min. Hence, the newly developed Fe3O4-Au@RGO nanocomposites were demonstrated to be viable for SERS detection of biomolecules and microbes and potential applications for magnetically capturing and hyperthermia treatment of bacteria. © 2022 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.saa.2022.121578

✓ نام ژورنال:

Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy

✓ سال انتشار:

2022

✓ کلیدواژه‌ها:

Core–shell nanoparticles; Hyperthermia treatment; Magnetically capturing; Reduced graphene oxide; Surface-enhanced Raman scattering

✓ عنوان پژوهش:

Rapid detection of bacteria using gold nanoparticles in SERS with three different capping agents: Thioglucose, polyvinylpyrrolidone, and citrate

✓ نویسندگان:

Deb M., Hunter R., Taha M., Abdelbary H., Anis H.

✓ خلاصه پژوهش:

The increase in outbreaks of emerging and re-emerging bacterial infections over the last few decades calls for their rapid detection and treatment. Surface-enhanced Raman spectroscopy (SERS) is a technique that can be applied to develop fast screening systems for bacterial presence in biological samples. Optimizing the capping agents in nanoparticle synthesis is important because capping agents are responsible for controlling the morphological features and chemical properties of the nanoparticles that are essential for SERS. To the best of our knowledge, this paper is the first to study the application of gold nanoparticles capped with thioglucose and polyvinylpyrrolidone (PVP) in SERS detection of bacteria as an alternative to the citrate-capped gold nanoparticles that are often used in SERS detection of bacteria. Three different species of bacteria were used in this study: Cutibacterium acnes, Escherichia coli and Staphylococcus aureus (methicillin-sensitive and methicillin-resistant). This study demonstrates that the thioglucose, citrate both show good contribution in bacterial species identification and the thioglucose shows the best among the three capping agents in two types of S. aureus identification. Moreover, although PVP showed high Raman peaks in the SERS spectrum for each type of bacteria, it showed least contribution in identifying species and strains due to its low efficacy in producing responses from different nucleic acid components in the bacteria cells. © 2022 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.saa.2022.121533

✓ نام ژورنال:

Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy

✓ سال انتشار:

2022

✓ کلیدواژه‌ها:

Capping agent; Dark field microscopy; Discriminant analysis; Gold nanoparticles; Raman bands; Surface enhanced Raman scattering

✓ **عنوان پژوهش:**

Specific and quantitative detection of bacteria based on surface cell imprinted SERS mapping platform

✓ **نویسندگان:**

Yang Y., Zeng C., Huang J., Wang M., Qi W., Wang H., He Z.

✓ **خلاصه پژوهش:**

Non-specificity and poor quantitative ability are the main challenges in surface-enhanced Raman scattering (SERS) technique, especially for the detection of bacteria in real samples. In this study, we presented a surface cell imprinted SERS mapping platform which is competent for the specific and quantitative detection of bacteria. The platform based on the fabrication of a surface cell imprinted substrate (SCIS) by which Escherichia coli (E. coli) can be captured and labelled by SERS tags which produces strong characteristic signal to indicate the capture of targets. We highlighted the specificity of this platform in the detection of E. coli, by comparing the performances toward Salmonella paratyphoid A, Bacillus subtilis, Enterococcus faecalis and Staphylococcus aureus. Upon integrating with SERS mapping technique, the platform displayed good quantitative ability toward E. coli with a wide linear range from 102 to 108 CFU/mL and a low detection limit of ~1.35 CFU/mL. Moreover, this novel SERS analysis platform was proved to be effective for E. coli detection in real probiotic beverage and chicken breast meat samples. By fabricating different SCISs, this platform can be replicated for the detection of other bacteria, which provides a promising application for real sample testing. © 2022 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.bios.2022.114524

✓ **نام ژورنال:**

Biosensors and Bioelectronics

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

Escherichia coli; Mapping; Specificity; Surface cell imprinting; Surface-enhanced Raman scattering (SERS)

✓ **عنوان پژوهش:**

Ultrasensitive and multiplex detection of four pathogenic bacteria on a bi-channel lateral flow immunoassay strip with three-dimensional membrane-like SERS nanostickers

✓ **نویسندگان:**

Wang C., Wang C., Li J., Tu Z., Gu B., Wang S.

✓ **خلاصه پژوهش:**

A lateral flow immunoassay (LFA) technique for sensitive and multiplexed on-site detection of bacteria remains a challenge. Here, we develop a bi-channel surface-enhanced Raman scattering (SERS)-based LFA by using three-dimensional membrane-like SERS tags as nanostickers (named GO@Au/Ag) for direct and ultrasensitive analysis of multiple pathogens in a single test. The grafting of numerous Ag satellites onto nanosticker significantly increased the relative surface area for bacteria binding and generated efficient SERS hotspots over large area to improve the sensing sensitivity. Antibody-labeled GO@Au/Ag nanostickers can rapidly stick onto the target bacteria and generate superior SERS signals and fluidity on the paper strip, thus conquering the adverse effect of bacteria size and improving the multiplex analysis ability of LFA. The integration of two different Raman reporter molecules into nanostickers allows simultaneous detection of four pathogens on two test lines, which significantly simplifies the reading process of SERS signals. The proposed biosensor can quantitatively detect four different bacteria in real clinical samples with low detection limit (9 cells mL−1 level), short assay time (20 min), high accuracy and excellent stability, indicating its great application potential for on-site detection of pathogens. © 2022 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.bios.2022.114525

✓ **نام ژورنال:**

Biosensors and Bioelectronics

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

Bacteria; Flexible nanosticker; Lateral flow immunoassay; Membrane-like SERS tag; Multiplex detection

✓ **عنوان پژوهش:**

Surface enhanced Raman scattering (SERS)-active bacterial detection by Layer-by-Layer (LbL) assembly all-nanoparticle microcapsules

✓ **نویسندگان:**

Li J., Khalenkow D., Volodkin D., Lapanje A., Skirtach A.G., Parakhonskiy B.V.

✓ **خلاصه پژوهش:**

Polymeric microcapsules composed by the Layer-by-Layer (LbL) approach have been used for various applications including drug delivery into cells and in vivo, conducting enzyme catalyzed reactions, performing sensoric functions. Typically, LbL-assembled microcapsules have been formulated via alternating deposition of positively and negatively charged polyelectrolytes onto sacrificial templates or so-called cores. In this work, we extend the LbL assembly to produce microcapsules solely based on nanoparticles instead of polymers. We have identified that 5 layers of nanoparticles is the minimum number of layers for a stable assembly of capsules on calcium carbonate templates. Subsequently, these capsules comprised of nanoparticles were applied as Surface Enhanced Raman Scattering (SERS) platform, where the nanoparticle-based shell of capsules is shown to enable SERS of both solutes and macromolecular structures such as bacterial cells. © 2022 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.colsurfa.2022.129547

✓ **نام ژورنال:**

Colloids and Surfaces A: Physicochemical and Engineering Aspects

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

Bacterial; Capsules; LbL; Multilayer; Polyelectrolyte; SERS

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Multifunctional Au nano-bridged nanogap probes as ICP-MS/SERS dual-signal tags and signal amplifiers for bacteria discriminating, quantitative detecting and photothermal bactericidal activity

✓ نویسندگان:

Huang X., Zhang Z., Chen L., Lin Y., Zeng R., Xu J., Chen S., Zhang J., Cai H., Zhou H., Sun P.

✓ خلاصه پژوهش:

Ultra-sensitive detection of pathogenic bacteria is of great significance in the early stage of bacterial infections and treatment. In this work, we report a novel strategy using multifunctional Au nano-bridged nanogap nanoparticles (Au NNPs)-based sandwich nanocomposites, that made of Concanavalin A-conjugated Fe3O4@SiO2 NPs (ConA-Fe3O4@SiO2 NPs)/bacteria/aptamer-modified Au NNPs (apt-Au NNPs), for bacteria discrimination and quantitative detection by surface-enhanced Raman scattering (SERS) and inductively coupled plasma mass spectrometry (ICP-MS), and subsequently photothermal antibacterial assay. The sandwich nanocomposite consists of ConA-Fe3O4@SiO2 NPs to magnetically enrich and photothermal killing bacteria, and dual-signal tags of apt-Au NNPs for both SERS sensing and ICP-MS quantification. This strategy can specifically distinguish different kinds of pathogenic bacteria, and provided a good linear relationship of Staphylococcus aureus (S. aureus) in the range from 50 to 104 CFU/mL with a detection limit of 11 CFU/mL, as well as realized ultralow amounts of bacterial detection in serum sample with high accuracy. Based on the quantitative detection, high antibacterial efficiency was monitored by ICP-MS. Overall, the established method combines bacteria discrimination, quantitative detection, and photothermal elimination with a simple and rapid process, which provides a novel way for the early diagnosis and treatment of bacterial infection. © 2022 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.bios.2022.114414

✓ نام ژورنال:

Biosensors and Bioelectronics

✓ سال انتشار:

2022

✓ کلیدواژه‌ها:

Au nano-bridged nanogap probes; Bacterial detection; Bacterial elimination; ICP-MS; SERS

✓ عنوان پژوهش:

Ultrasensitive multichannel immunochromatographic assay for rapid detection of foodborne bacteria based on two-dimensional film-like SERS labels

✓ نویسندگان:

Shen W., Wang C., Zheng S., Jiang B., Li J., Pang Y., Wang C., Hao R., Xiao R.

✓ خلاصه پژوهش:

Rapid and sensitive detection of multiple foodborne bacteria without DNA amplification is still challenging. Here, we proposed an immunochromatographic assay (ICA) with multiplex analysis ability and high sensitivity for direct detection of bacteria in real food samples, based on an improved surface-enhanced Raman scattering (SERS) sensing strategy. Multifunctional Au shell-coated graphene oxide nanosheets (GO@Au) were fabricated and for the first time introduced into the ICA system as a two-dimensional film-like SERS label, which possessed huge surface area, excellent stability, and superior SERS activity. Different from the conventional spherical nanotags, the antibody-conjugated GO@Au nanosheet effectively and rapidly adhered to bacterial cells, improved the dispersibility of bacteria-nanolabel complexes on the ICA strips, and provided numerous stable hotspots for SERS signal enhancement. The combination of GO@Au labels and the ICA system achieved the multiplex and ultrasensitive determination of three major foodborne pathogens, namely, Staphylococcus aureus, Escherichia coli O157:H7, and Salmonella typhimurium, in a single test, with low detection limits (8, 10, and 10 cells/mL) and short detection time (20 min). The proposed biosensor demonstrated high stability and good accuracy in various food samples and is thus a promising tool for the rapid identification of bacteria. © 2022 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.jhazmat.2022.129347

✓ نام ژورنال:

Journal of Hazardous Materials

✓ سال انتشار:

2022

✓ کلیدواژه‌ها:

Film-like GO@Au; Foodborne bacteria; Immunochromatographic assay; Multiplex detection; SERS

✓ **عنوان پژوهش:**

Surface-enhanced Raman spectral investigation of antibacterial activity of zinc 3-chlorobenzoic acid complexes against Gram-positive and Gram-negative bacteria

✓ **نویسندگان:**

Ditta A., Majeed M.I., Nawaz H., Iqbal M.A., Rashid N., Abubakar M., Akhtar F., Nawaz A., Hameed W., Iqbal M., Bari R.Z.A., Dastgir G.

✓ **خلاصه پژوهش:**

Background: Raman spectroscopy is an effective tool for determining the antibacterial actitivites of organometallic compounds against different bacterial strains. Objectives: The purpose of current study is to check the anibacterial activites of ligand (3-chlorobenzoic acid) and its respective zinc complex against gram positive and gram-negative bacterial strains by using surface enhanced Raman spectroscopy (SERS). Methods: The ligand (3-chlorobenzoic acid) and its respective zinc complex caused different biochemical changes in gram-positive and gram-negative bacterial strains such as lipid contents, DNA/RNA contents, proteins contents, peptidoglycan contents and bacterial spore contents which can be observed with different SERS spectral features. Furthermore, PCA was employed for differentiating the mechanism of action of zinc complexes against gram-positive bacterial strain and gram-negative bacterial strain. Results: Surface enhanced Raman spectroscopy (SERS) has been employed for analyzing the antibiotic activities of 3-chlorobenzoic acid ligands and their respective zinc complexes against Escherichia coli (gram-negative) and Bacillus subtilis (gram-positive) bacterial strains. The bioactivity assay and SERS spectral results clearly show that the complex causes more degradation in both bacterial cells (E. coli and B. subtilis) as compared to ligand. Furthermore, PCA was employed for differentiating the mechanism of action of zinc complexes against gram-positive bacterial strain and gram-negative bacterial strain. Conclusion: SERS technique along with chemometric tools have successfully differentiated the antibiotic activities of 3-chlorobenzoic acid ligands and their respective zinc complexes against Escherichia coli (gram-negative) and Bacillus subtilis (gram-positive) bacterial strains. © 2022

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.pdpdt.2022.102941

✓ **نام ژورنال:**

Photodiagnosis and Photodynamic Therapy

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

Bacillus subtilis; Escherichia coli; Ligand & complex exposure; Principal component analysis; Surface-enhanced Raman spectroscopy

✓ عنوان پژوهش:

Organometallic hotspot engineering for ultrasensitive EC-SERS detection of pathogenic bacteria-derived DNAs

✓ نویسندگان:

Lee S.H., Lee W.-C., Koh E.H., Ansah I.B., Yang J.-Y., Mun C., Lee S., Kim D.-H., Jung H.S., Park S.-G.

✓ خلاصه پژوهش:

The sensitivity and limit-of-detection (LOD) of the traditional surface-enhanced Raman spectroscopy (SERS) platform suffer from the requirement of precise positioning of small analytes, including DNAs and bacteria, into narrow hotspots. In this study, a novel SERS sensor was developed using electrochemical deposition onto metal nanopillars (ECOMPs) combined with complementary DNAs (cDNAs) for the detection of pathogenic bacteria. Applying a redox potential to AuCl4− ions actively engineered the organometallic hotspots based on the cDNAs in a short time (<10 min) and simultaneously produced SERS signals. Because of the influence of potential-driven morphological properties on the SERS efficiency in the cDNA domains and the resonant coupling of internal fields with the fields confined between adjacent ECOMPs-cDNAs, the optimum growth time was determined to be 5 min. The EC-SERS detection and discrimination of Enterococcus faecium and Staphylococcus aureus were successfully carried out because of the DNA complementarity. Compared with plasmonic metal nanopillars (MPs)-cDNAs, the enhancement factor of the ECOMPs-cDNAs was estimated to be ∼2.0 × 103. A quantitative investigation revealed that a highly linear progression in the target DNA concentration range (0.05–100 nM) and a LOD of ∼0.035 nM were achieved. The specificity of the ECOMPs-cDNAs was validated by cross-hybridization. The platform was also used to assay human whole blood containing 0.1 nM bacterial DNAs. The proposed strategy provides the potential for highly sensitive SERS-based multiplex DNA detection in clinical diagnostics. © 2022 The Authors

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.bios.2022.114325

✓ نام ژورنال:

Biosensors and Bioelectronics

✓ سال انتشار:

2022

✓ کلیدواژه‌ها:

DNA scale Hotspot; Electrochemical surface-enhanced Raman spectroscopy; In situ deposition; Pathogenic bacteria

✓ عنوان پژوهش:

Plasmonic microneedle arrays for rapid extraction, SERS detection, and inactivation of bacteria

✓ نویسندگان:

Wang Y., Ni H., Li H., Chen J., Zhang D., Fu L.

✓ خلاصه پژوهش:

Microbial contamination of food is a critical public health issue worldwide, making the rapid, efficient, and safe sensing strategies for foodborne microbes in urgent need. In this work, a plasmonic microneedle (MN) array patch was developed for rapid extraction and surface-enhanced Raman spectroscopy (SERS) detection of a model bacteria, Escherichia coli (E. coli). A hydrophilic MN matrix was firstly prepared by crosslinking [2-(methacryloyloxy)ethyl]trimethylammonium chloride (TMA), 2-carboxyethyl acrylate (CAA), and 2-hydroxyethyl methacrylate (HEMA) in a micro-mold. Then the obtained MN patch was treated with ozone and coated with SERS-active gold nanopopcorns (GNpops) that were modified with the specific aptamer towards E. coli. The resultant plasmonic MN patch could extract E. coli from agarose simulant in 3 min and was capable of on-MN SERS analysis with a detection limit of 143 CFU/g. The proposed detection method exhibited great specificity to E. coli and was feasible for evaluating the E. coli contamination of commercial mutton samples. Moreover, the extracted bacteria could be effectively inactivated through photothermal sterilization. The work opened a new avenue for simplifying the detection procedures for microorganisms and provided a potential approach for rapid and on-site microbial monitoring through the SERS-active MN patch. © 2022 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.cej.2022.136140

✓ نام ژورنال:

Chemical Engineering Journal

✓ سال انتشار:

2022

✓ کلیدواژه‌ها:

Escherichia coli; Food safety; Gold nanopopcorn; Microneedle array patch; SERS

✓ عنوان پژوهش:

Photoreduced Ag+ surrounding single poly(4-cyanostyrene) nanoparticles for undifferentiated SERS sensing and killing of bacteria

✓ نویسندگان:

Liu Y.-Q., Zhu W., Yuan Q., Hu J.-M., Zhang X., Shen A.-G.

✓ خلاصه پژوهش:

Developing a rapid, low cost and sensitive sensing strategy for undifferentiated detection and fast killing of bacterial pathogens are critical to alleviating bacteria infections. Here, we propose a direct photoreduction method to synthesize the SERS tag by integrating poly(4-cyanostyrene) nanoparticles (NPs) and silver ions, which are applied as bio-sensing system for bacteria sensing and fast killing. Under a focused laser spot, silver ions on the surface of the poly(4-cyanostyrene) NPs could be photoreduced into Ag NPs, thereby causing the Raman signal amplification of poly(4-cyanostyrene) NPs up to 40 times, and there is a good linear correlation between the Raman intensity of poly(4-cyanostyrene) NPs and different concentrations of Ag+. Moreover, 4-mercaptophenylboronic acid, performing the same recognition function for both the Gram-positive and Gram-negative bacteria, is used as bridge between the bacteria and Ag+ by the inherent chemical bonding. Based on further constructed bio-sensing system, we achieved the quick count and killing of both Gram-positive bacteria, e.g., Staphylococcus aureus (S. aureus), and Gram-negative bacteria, e.g., Escherichia coli (E. coli). Notably, the sensing strategy can detect at least ~100 cells of E. coli, ~10 cells of S. aureus and ~10 cells of their mixture in less than 40 min. The detection accuracy for actual samples can also reach over 80% and the bacteria were entirely killed by Ag+ after the detection, avoiding bacterial contamination in the environment. This novel method is anticipated to perform as a simple yet effective tool for fast and sensitive bacteria counting and killing. © 2022 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.talanta.2022.123450

✓ نام ژورنال:

Talanta

✓ سال انتشار:

2022

✓ کلیدواژه‌ها:

Bacteria; Photoreduction; SERS; Silver ions; Undifferentiated sensing and killing

✓ **عنوان پژوهش:**

Surface-enhanced Raman spectroscopy enabled evaluation of bacterial inactivation

✓ **نویسندگان:**

Wang W., Rahman A., Huang Q., Vikesland P.J.

✓ **خلاصه پژوهش:**

An improved understanding of bacterial inactivation mechanisms will provide useful insights for infectious disease control and prevention. We evaluated bacterial response to several inactivation methods using surface-enhanced Raman spectroscopy (SERS). The results indicate that changes in the SERS signal are highly related to cellular disruption and that cellular changes arising after cell inactivation cannot be ignored. The membrane integrity of heat and the combination of UV254 and free chlorine (UV254/chlorine) treated Pseudomonas syringae (P. syringae) cells were severely disrupted, leading to significantly increased peak intensities. Conversely, ethanol treated bacteria exhibited intact cell morphologies and the SERS spectra remained virtually unchanged. On the basis of time dependent SERS signals, we extracted dominant SERS patterns. Peaks related to nucleic acids accounted for the main changes observed during heat, UV254, and UV254/chlorine treatment, likely due to their outward diffusion from the cell cytoplasm. For free chlorine treated P. syringae, carbohydrates and proteins on the cell membrane were denatured or lost, resulting in a decrease in related peak intensities. The nucleobases were likely oxidized when treated with UV254 and chlorine, thus leading to shifts in the related peaks. The generality of the method was verified using two additional bacterial strains: Escherichia coli and Bacillus subtilis as well as in different water matrices. The results suggest that SERS spectral analysis is a promising means to examine bacterial stress response at the molecular level and has applicability in diverse environmental implementations. © 2022 Elsevier Ltd

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.watres.2022.118668

✓ **نام ژورنال:**

Water Research

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

Bacteria; Inactivation; Multivariate analysis; Surface-enhanced Raman spectroscopy; Water

✓ **عنوان پژوهش:**

Endophytes from blueberry (Vaccinium sp.) fruit: Characterization of yeast and bacteria via label-free surface-enhanced Raman spectroscopy (SERS)

✓ **نویسندگان:**

Vaitiekūnaitė D., Bružaitė I., Snitka V.

✓ **خلاصه پژوهش:**

Blueberries (Vaccinium sp.) are consumed all around the globe, however, their endophytic community has not been thoroughly researched, specifically their fruit endophytes. We aimed to isolate and analyze easily cultivable blueberry fruit endophytes to help in future research, concerning probiotic microorganisms. Twelve strains were isolated in this pilot study, genetically homologous with Staphylococcus hominis, Staphylococcus cohnii, Salmonella enterica, Leuconostoc mesenteroides, and [Candida] santamariae. To determine the molecular composition of these isolates we used label-free surface-enhanced Raman spectroscopy (SERS). To our knowledge, this is the first time that SERS spectra for L. mesenteroides and C. santamariae are presented, as well as the first report of Candida yeast, isolated specifically from blueberry fruits. Our findings suggest that the differences in tested yeast and bacteria SERS spectra and subsequent differentiation are facilitated by minor shifts in spectral peak positions as well as their intensities. Moreover, we used principal component and discriminant function analyses to differentiate chemotypes within our isolate group, proving the sensitivity of the technique and its usefulness to recognize different strains in plant-associated microbe samples, which will aid to streamline future studies in biofertilizers and biocontrol agents. © 2022 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.saa.2022.121158

✓ **نام ژورنال:**

Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

Bacteria; Endophytes; Fruit; Surface-enhanced Raman spectroscopy; Vaccinium; Yeast

✓ **عنوان پژوهش:**

In Situ Collection and Rapid Detection of Pathogenic Bacteria Using a Flexible SERS Platform Combined with a Portable Raman Spectrometer

✓ **نویسندگان:**

Zhao H., Zheng D., Wang H., Lin T., Liu W., Wang X., Lu W., Liu M., Liu W., Zhang Y., Liu M., Zhang P.

✓ **خلاصه پژوهش:**

This study aims to develop a simple, sensitive, low-cost, environmentally friendly and flexible surface-enhanced Raman scattering (SERS) platform, combined with a portable Raman spec-trometer, for the rapid and on-site SERS detection of bacteria. Commercial tobacco packaging paper (TPP) with little background interference was used as a loading medium that effectively adsorbed Au nanoparticles and provided sufficient “hot spots”. This Au-tobacco packaging paper (Au-TPP) substrate used as a flexible SERS platform can maximize sample collection by wiping irregular sur-faces, and was successfully applied to the on-site and rapid detection of pathogenic bacteria. Raman fingerprints of pathogenic bacteria can be obtained by SERS detection of spiked pork using wipeable Au-TPP, which verifies its value in practical applications. The results collected by SERS were further verified by polymerase chain reaction (PCR) results. It showed several advantages in on-site SERS detection, including accurate discrimination, simple preparation, easy operation, good sensitivity, accuracy and reproducibility. This study indicates that the established flexible SERS platform has good practical applications in pathogenic bacterial identification and other rapid detections. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.3390/ijms23137340

✓ **نام ژورنال:**

International Journal of Molecular Sciences

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

flexible SERS platform; in situ test; pathogenic bacteria; rapid detection

✓ **عنوان پژوهش:**

Development of a portable SERS method for testing the antibiotic sensitivity of foodborne bacteria

✓ **نویسندگان:**

Gukowsky J.C., He L.

✓ **خلاصه پژوهش:**

A method for testing the antibiotic susceptibility of foodborne bacterial samples using a portable Raman spectrometer has been developed. Surface-enhanced Raman spectroscopy (SERS) was used to obtain the spectra from bacterial samples collected on a filter membrane after incubation with antibiotics. The SERS spectra revealed characteristic antibiotic response patterns, which can be used to assess the antibiotic sensitivity of the samples. Several species of bacteria, including Escherichia coli, Bacillus cereus, and Salmonella enterica, were used to test the procedure, as well as multiple classes of antibiotics. Characteristic bacterial SERS peaks could be identified in the spectra, as well as clear antibiotic response patterns that were consistent across the different species of bacteria and could be used to reliably determine the antibiotic sensitivity of the samples. The portable SERS method was then used to test bacteria isolated from ground beef, and the results show the procedure could be used to accurately test the antibiotic sensitivity of bacteria isolated from real food samples. Further optimization of this method to test the filtered liquid obtained from bacterial samples has demonstrated the capability of a simpler approach to identify antibiotic response patterns. The effectiveness and improved accessibility of the portable SERS method indicates that these procedures have great potential for future use in low-resource settings, which will facilitate the monitoring and control of antibiotic resistance. © 2022 Elsevier B.V.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.mimet.2022.106496

✓ **نام ژورنال:**

Journal of Microbiological Methods

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

Antibiotic resistance; Bacteria; Food microbiology; SERS; Spectroscopy

✓ **عنوان پژوهش:**

Assessing the effect of different pH maintenance situations on bacterial SERS spectra

✓ **نویسندگان:**

Wei L., Liu W., Zhu C., Wang D., Gong Z., Fan M.

✓ **خلاصه پژوهش:**

Phenotyping of bacteria with vibrational spectroscopy has caught much attention in bacteria-related research. It is known that many factors could affect this process. Among them, solution pH maintenance is crucial, yet its impact on the bacterial SERS spectra is surprisingly neglected. In this work, we focused on two situations related to pH maintenance: the effect of the same buffer on the SERS spectra of bacteria under different pH values, and the influence of different buffers on the SERS spectra of bacteria under the same pH value. Specifically, Britton-Robison (BR) buffer was used to evaluate the effect of pH value on bacteria SERS spectra thanks to its wide pH range. Four different buffers, namely BR buffer, acetate buffer, phosphate buffer, and carbonate buffer, were used to illustrate the impact of buffer types on SERS spectra of bacteria. The results showed that the intensity and number of characteristic peaks of the SERS spectra of Gram-negative (G −) bacteria changed more significantly than Gram-positive (G +) bacteria with the change of pH value. Furthermore, compared with phosphate buffer and carbonate buffer, BR buffer could bring more characteristic SERS bands with better reproducibility, but slightly inferior to acetate buffer. In conclusion, the influence of the pH and types of the buffer on the SERS spectra of bacteria are worthy of further discussion. © 2022, Springer-Verlag GmbH Germany, part of Springer Nature.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1007/s00216-022-04125-0

✓ **نام ژورنال:**

Analytical and Bioanalytical Chemistry

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

Bacteria; Buffer type; PCA; pH value; SERS

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Dual-Approach Electrochemical Surface-Enhanced Raman Scattering Detection of Mycobacterium tuberculosis in Patient-Derived Biological Specimens: Proof of Concept for a Generalizable Method to Detect and Identify Bacterial Pathogens

✓ نویسندگان:

Hendricks-Leukes N.R., Jonas M.R., Mlamla Z.C., Smith M., Blackburn J.M.

✓ خلاصه پژوهش:

The recent surge in infectious disease-causing pathogens, resulting in global catastrophe, has merited a pivotal quest toward point-of-care (POC) diagnostics. Mycobacterium tuberculosis (MTB) is still the top bacterium-based infectious disease-causing pathogen worldwide. In a concerted effort toward simplifying and decentralizing the discriminatory screening of MTB causing pathogens, electrochemical surface-enhanced Raman scattering (EC-SERS) was adopted to create a customized screening tool. The development strategy combined five key factors, including (i) a simplified Tollens'-based chemical synthesis method for bulk supply of silver nanoparticles, (ii) the deliberate surface modification of nanoparticles with carefully selected polyelectrolytes to resemble the conditioning layer usually found on a natural substratum, (iii) uniform SERS-active films formed through simple unprogrammed assembly, (iv) the controlled manipulation of the local electric field through applied voltage using a technique that does not conform to the limitations of classical EC-SERS, and (v) the inherent specificity of the target-specific SERS vibrational signature. The EC-SERS platform was able to discriminatively detect and identify TB-derived mycobacteria, including three clinically relevant MTB strains, TB-H37Rv, TB-HN878, and TB-CDC1551. Moreover, a customized voltage stepping protocol, compatible with either the inclusion of a short preincubation step or with in situ EC-SERS is illustrated. From the obtained SERS vibrational signatures, a band indicating a mode unique to TB-derived/TB-affiliated mycobacteria and thus not observed for other bacterial types used in this study was illustrated. Furthermore, provisional investigation, done as prelude for assessing the potential for translational adaptability of the EC-SERS technique toward POC clinical settings for sputum and urine specimens, was carried out. © 2022 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acssensors.2c00121

✓ نام ژورنال:

ACS Sensors

✓ سال انتشار:

2022

✓ کلیدواژه‌ها:

EC-SERS; label-free SERS detection; Mycobacterium tuberculosis; polyelectrolyte-wrapped silver nanoparticles; sequence-based voltage stepping; sputum; urine

✓ **عنوان پژوهش:**

Differentiation and classification of bacterial endotoxins based on surface enhanced Raman scattering and advanced machine learning

✓ **نویسندگان:**

Yang Y., Xu B., Haverstick J., Ibtehaz N., Muszyński A., Chen X., Chowdhury M.E.H., Zughaier S.M., Zhao Y.

✓ **خلاصه پژوهش:**

Bacterial endotoxin, a major component of the Gram-negative bacterial outer membrane leaflet, is a lipopolysaccharide shed from bacteria during their growth and infection and can be utilized as a biomarker for bacterial detection. Here, the surface enhanced Raman scattering (SERS) spectra of eleven bacterial endotoxins with an average detection amount of 8.75 pg per measurement have been obtained based on silver nanorod array substrates, and the characteristic SERS peaks have been identified. With appropriate spectral pre-processing procedures, different classical machine learning algorithms, including support vector machine, k-nearest neighbor, random forest, etc., and a modified deep learning algorithm, RamanNet, have been applied to differentiate and classify these endotoxins. It has been found that most conventional machine learning algorithms can attain a differentiation accuracy of >99%, while RamanNet can achieve 100% accuracy. Such an approach has the potential for precise classification of endotoxins and could be used for rapid medical diagnoses and therapeutic decisions for pathogenic infections. © 2022 The Royal Society of Chemistry

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/d2nr01277d

✓ **نام ژورنال:**

Nanoscale

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Triple-Function Au-Ag-Stuffed Nanopancakes for SERS Detection, Discrimination, and Inactivation of Multiple Bacteria

✓ **نویسندگان:**

Zhou S., Guo X., Huang H., Huang X., Zhou X., Zhang Z., Sun G., Cai H., Zhou H., Sun P.

✓ **خلاصه پژوهش:**

New strategies combining sensitive pathogenic bacterial detection and high antimicrobial efficacy are urgently desirable. Here, we report smart triple-functional Au-Ag-stuffed nanopancakes (AAS-NPs) exhibiting (1) controllably oxidative Ag-etching thickness for simultaneously obtaining the best surface-enhanced Raman scattering (SERS) enhancement and high Ag-loading antibacterial drug delivery, (2) expressive Ag+-accelerated releasing capability under neutral phosphate-buffered saline (PBS) (pH ∼7.4) stimulus and robust antibacterial effectiveness involving sustainable Ag+release, and (3) three-in-one features combining specific discrimination, sensitive detection, and inactivation of different pathogenic bacteria. Originally, AAS-NPs were synthesized by particle growth of the selective Ag-etched Au@Ag nanoparticles with K3[Fe(CN)6], followed by the formation of an unstable Prussian blue analogue for specifically binding with bacteria through the cyano group. Using specific bacterial "fingerprints" resulting from the introduction of dual-function 4-mercaptophenylboronic acid (4-MPBA, serving as both the SERS tag and internal standard) and a SERS sandwich nanostructure that was made of bacteria/SERS tags/AAS-NPs, three bacteria (E. coli, S. aureus, and P. aeruginosa) were highly sensitively discriminated and detected, with a limit of detection of 7 CFU mL-1. Meanwhile, AAS-NPs killed 99% of 1 × 105CFU mL-1bacteria within 60 min under PBS (pH ∼7.4) pretreatment. Antibacterial activities of PBS-stimulated AAS-NPs against S. aureus, E. coli, and P. aeruginosa were extraordinarily increased by 64-fold, 72-fold, and 72-fold versus PBS-untreated AAS-NPs, respectively. The multiple functions of PBS-stimulated AAS-NPs were validated by bacterial sensing, inactivation in human blood samples, and bacterial biofilm disruption. Our work exhibits an effective strategy for simultaneous bacterial sensing and inactivation. © 2022 American Chemical Society. All rights reserved.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acs.analchem.1c04920

✓ **نام ژورنال:**

Analytical Chemistry

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

✓ **عنوان پژوهش:**

Effectiveness of Administering a Mixture of Lactic Acid Bacteria to Control Salmonella ser. Enteritidis Infections in Broilers

✓ **نویسندگان:**

Kim Y.-J., Youk S., Song C.-S.

✓ **خلاصه پژوهش:**

Non-typhoidal Salmonella spp. cause persistent asymptomatic infections in poultry. The consumption of Salmonella-infected poultry products is associated with food poisoning. One of the pathogens that causes such infections is Salmonella ser. Enteritidis (SE). Therefore, alternative measures are required for better control of salmonellosis and to reduce potential antibiotic use. Here, the efficacy of a mixture of lactic acid bacteria (LAB), formulated based on competitive exclusion, was evaluated. The LAB mixture was administered to 1-to 20-day-old chickens using different schemes; the chickens were then inoculated with an SE strain, which was previously identified to be prevalent in broiler breeder farms. Even with short-term administration, the group treated with LAB exhibited lower SE isolation levels in the spleen and cecal content and greater weight gain than that in the control group. This protective efficacy of LAB was retained even after two weeks without LAB administration. According to the results of animal experiments and field tests, evidence of SE infection was absent after treatment of the animals with the LAB formulation used in this study. Thus, this LAB mixture can be used as a potential strategy for protecting poultry farms from Salmonella contamination. This will also help reduce potential antibiotic use. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.3390/ani12030374

✓ **نام ژورنال:**

Animals

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

Probiotics; Salmonella ser. Enteritidis; SE detection; Short-term administration

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

A novel surface-enhanced Raman scattering method for detecting fish pathogenic bacteria with Fe3O4@PEI nanocomposite and concentrated Au@Ag

✓ **نویسندگان:**

Jia N., Xiong Y., Wang Y., Lu S., Zhang R., Kang Y., Du Y.

✓ **خلاصه پژوهش:**

A label-free and novel surface-enhanced Raman scattering (SERS) method has been studied to rapidly detect common fish pathogenic bacteria (Escherichia coli, Vibrio anguillarum, Vibrio harveyi, Edwardsiella piscicida, and Pseudomonas plecoglossicida). The marriage of magnetic nanospheres (Fe3O4) with polyethylenimine (PEI) could trigger surface charge modifications of Fe3O4, making it effective to capture negatively charged bacteria. After the rapid bacterial capture procedure within 10 min, Au@Ag core-shell bimetallic nanoparticles served as hotspot providers to facilitate the enhancement of biological Raman signals. The results demonstrated that the minimum detection limit of E. piscicida could be as low as 105 cfu/ml. The peak intensity at 1628 cm−1 (E. piscicida) showed a linear relationship with the logarithm of the bacterial concentration (R2 = 0.997). A mimic test was conducted by spiking E. piscicida into tap water. Linear discriminant analysis (LDA) was also harnessed to classify different types of fish bacteria. And the positive rates of the training set and the prediction set were 100% and 80%, respectively. The whole experimental procedure only takes 20 min. This method opens a new avenue for the rapid detection and identification of fish pathogenic bacteria. © 2021 John Wiley & Sons, Ltd.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1002/jrs.6282

✓ **نام ژورنال:**

Journal of Raman Spectroscopy

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

concentrated Au@Ag nanoparticles; Fe3O4@PEI; fish bacteria; LDA; SERS

✓ **عنوان پژوهش:**

A 3D-ACEK/SERS system for highly efficient and selectable electrokinetic bacteria concentration/detection/ antibiotic-susceptibility-test on whole blood

✓ **نویسندگان:**

Chen K.-H., Lee S.-H., Kok L.-C., Ishdorj T.-O., Chang H.-Y., Tseng F.-G.

✓ **خلاصه پژوهش:**

This study demonstrates a novel multi-functional microfluidic system, designated three dimensional Alternative Current Electrokinetic/Surface Enhanced Raman Scattering (3D-ACEK/SERS), which can concentrate bacteria from whole blood, identify bacterial species, and determine antibiotic susceptibilities of the bacteria rapidly. The system consists of a hybrid electrokinetic mechanism, integrating AC-electroosmosis (AC-EO) and dielectrophoresis (DEP) that allows thousand-fold concentration of bacteria, including S. aureus, Escherichia coli, and Chryseobacterium indologenes, in the center of an electrode with a wide range of working distance (hundreds to thousands of μm), while exclusion of blood cells through negative DEP forces. This microchip employs SERS assay to determine the identity of the concentrated bacteria in approximately 2 min with a limit of detection of 3 CFU/ml, 5 orders of magnitude lower than that using standard centrifugation–purification process. Finally, label-free antibiotic susceptibility testing has been successfully demonstrated on the platform using both antibiotic-sensitive and multidrug-resistant bacterial strains illustrating a potential utility of the system to clinical applications. © 2021

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1016/j.bios.2021.113740

✓ **نام ژورنال:**

Biosensors and Bioelectronics

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

3D electrodes; Antibiotic-susceptibility-test (AST); Bacteremia; Dielectrophoresis (DEP); Hybrid AC-Electroosmosis (ACEO); Selective bacteria concentration

✓ **عنوان پژوهش:**

3D imaging of single bacterial cells using surface-enhanced Raman spectroscopy with a multivariate curve resolution model

✓ **نویسندگان:**

Liu W., Jing C., Liu X., Du J.

✓ **خلاصه پژوهش:**

Imaging biomolecules within a single bacterial cell is crucial for understanding cellular genetic mechanisms. Herein, we exploited a surface-enhanced Raman spectroscopy (SERS) imaging strategy for single cell analysis. Cellular biosynthesized Ag nanoparticles (NPs) provided the necessary enhancement for SERS imaging. Multiple complementary techniques, including high-resolution transmission electron microscopy (HR-TEM), high-angle annular dark-field (HAADF)-scanning transmission electron microscopy (STEM), and energy-dispersive X-ray spectroscopy (EDX), were used to characterize the biogenic Ag NPs in cells. Three-dimensional SERS imaging maps displayed spectral information of biomolecules within the single cell. The multivariate curve resolution (MCR) model and principal component analysis (PCA) model were used to analyze the cellular SERS imaging maps. The MCR model, with a specific constraint of non-negativity, resulted in meaningful identification of biomolecules associated with Ag reduction. Focusing on the molecular level reveals that Pantoea sp. IMH utilizes several mechanisms to synthesize Ag NPs, including cytoplasm reduction by glucose or nicotinamide adenine dinucleotide (NADH)-dependent reductase, and extracellular reduction by an electron transfer chain containing quinone and cytochrome C. Our results shed new light on the Ag NP biosynthesis mechanism and single cell Raman analysis. © The Royal Society of Chemistry.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1039/d1an01879e

✓ **نام ژورنال:**

Analyst

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Characterization of Bacteria Using Surface-Enhanced Raman Spectroscopy (SERS): Influence of Microbiological Factors on the SERS Spectra

✓ نویسندگان:

Allen D.M., Einarsson G.G., Tunney M.M., Bell S.E.J.

✓ خلاصه پژوهش:

SERS is currently being explored as a rapid method for identification of bacteria but variation in the experimental procedures has resulted in considerable variation in the spectra reported for a range of bacterial species. Here, we show that mixing bacteria with a conventional citrate-reduced silver colloid (CRSC) and drying the resulting suspension yield highly reproducible spectra. These signals were due to intracellular components released when the structure of the bacteria was disrupted during sample preparation. This reproducibility allowed us to examine the effects of variables that do not arise in SERS of simple solutions but are relevant in studies of bacteria. These included growth phase and biological variation, which occurred when the same bacterial isolates were cultured under nominally identical conditions on different days. It was found that even under optimal standardized conditions the effect of differences in experimental parameters such as growth phase was very large in some bacterial species but insignificant in others. This suggests that it is important to avoid drawing general conclusions about bacterial SERS based on studies using small numbers of samples. Similarly, discrimination between bacterial species was straightforward when a small number of isolates with distinct spectral features were investigated; however, this became more challenging when more bacterial species were included, as this increased the possibility of finding different species of bacteria with similar spectra. These observations are important because they clearly delineate the challenges that will need to be addressed if SERS is to be used for clinical applications. © 2022 American Chemical Society. All rights reserved.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acs.analchem.2c00817

✓ نام ژورنال:

Analytical Chemistry

✓ سال انتشار:

2022

✓ کلیدواژه‌ها:

✓ عنوان پژوهش:

Rapid Identification of Different Pathogenic Spore-Forming Bacteria in Spice Powders Using Surface-Enhanced Raman Spectroscopy and Chemometrics

✓ نویسندگان:

Liu S., Zhu Y., Li M., Liu W., Zhao L., Ma Y.Y., Xu L., Wang N., Zhao G., Liang D., Yu Q.

✓ خلاصه پژوهش:

Bacterial spores were isolated and purified from three powder spices: garlic powder, onion powder, and five-spice powder. The rapid identification of different bacteriophages was achieved by surface-enhanced Raman spectroscopy (SERS) combined with chemometrics. Five bacilli were isolated in the powdered spices: Clostridium perfringens, Bacillus subtilis, Bacillus amyloliquefaciens, Bacillus licheniformis, and Paenibacillus pabuli. The Raman bands of each bacillus were significantly different with regard to the locations of the peaks and the intensity of the characteristic fingerprint profiles in the spectral range of 400–1800 cm−1. The training set and prediction set of the k-nearest neighbor (KNN) showed the recognition rate as 92.0% and 72.0%, respectively. The recognition rates of the least squares support vector machine (LS-SVM) were 100.0% and 86.3%, respectively. LS-SVM is the optimum predictive model. Hence, SERS allowed rapid differentiation of different phylogenetic taxa and provided technical support and a scientific basis for rapid and accurate detection of spore-forming bacteria in different powder preparations. © 2022, The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1007/s12161-022-02326-y

✓ نام ژورنال:

Food Analytical Methods

✓ سال انتشار:

2022

✓ کلیدواژه‌ها:

16SrDNA; Chemical stoichiometry; Pathogenic spore-forming bacteria; Surface-enhanced Raman spectroscopy

✓ **عنوان پژوهش:**

Phenotyping Bacteria through a Black-Box Approach: Amplifying Surface-Enhanced Raman Spectroscopy Spectral Differences among Bacteria by Inputting Appropriate Environmental Stress

✓ **نویسندگان:**

Liu W., Wei L., Wang D., Zhu C., Huang Y., Gong Z., Tang C., Fan M.

✓ **خلاصه پژوهش:**

Surface-enhanced Raman spectroscopy (SERS) stands out in the field of microbial analysis due to its rich molecular information, fast analysis speed, and high sensitivity. However, achieving strain-level differentiation is still challenging because numerous bacterial species inevitably have very similar SERS profiles. Here, a method inspired by the black-box theory was proposed to boost the spectral differences, where the undifferentiated bacteria was considered as a type of black-box, external environmental stress was used as the input, and the SERS spectra of bacteria exposed to the same stress was output. For proof of the concept, three types of environmental stress were explored, i.e., ethanol, ultraviolet light (UV), and ultrasound. Enterococcus faecalis (E. faecalis) and three types of Escherichia coli (E. coli) were all subjected to the stimuli (stress) before SERS measurement. Then the collected spectra were processed only by simple principal component analysis (PCA) to achieve differentiation. The results showed that appropriate stress was beneficial to increase the differences in bacterial SERS spectra. When sonication at 490 W for 60 s was used as the input, the optimal differentiation of bacteria at the species (E. faecalis and E. coli) and strain-level (three E. coli) can be achieved. © 2022 American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acs.analchem.2c00502

✓ **نام ژورنال:**

Analytical Chemistry

✓ **سال انتشار:**

2022

✓ **کلیدواژه‌ها:**

TEKSAN Detect Precisely

✓ **عنوان پژوهش:**

Plasmonic Au@Ag@mSiO2Nanorattles for in Situ Imaging of Bacterial Metabolism by Surface-Enhanced Raman Scattering Spectroscopy

✓ **نویسندگان:**

De Marchi S., García-Lojo D., Bodelón G., Pérez-Juste J., Pastoriza-Santos I.

✓ **خلاصه پژوهش:**

It is well known that microbial populations and their interactions are largely influenced by their secreted metabolites. Noninvasive and spatiotemporal monitoring and imaging of such extracellular metabolic byproducts can be correlated with biological phenotypes of interest and provide new insights into the structure and development of microbial communities. Herein, we report a surface-enhanced Raman scattering (SERS) hybrid substrate consisting of plasmonic Au@Ag@mSiO2 nanorattles for optophysiological monitoring of extracellular metabolism in microbial populations. A key element of the SERS substrate is the mesoporous silica shell encapsulating single plasmonic nanoparticles, which furnishes colloidal stability and molecular sieving capabilities to the engineered nanostructures, thereby realizing robust, sensitive, and reliable measurements. The reported SERS-based approach may be used as a powerful tool for deciphering the role of extracellular metabolites and physicochemical factors in microbial community dynamics and interactions. © 2021 The Authors. Published by American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acsami.1c21812

✓ **نام ژورنال:**

ACS Applied Materials and Interfaces

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

microbial colonies; pH monitoring; plasmonic hybrids; plasmonic silica nanorattles; SERS sensor

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Anti-bacterial mechanism of the P-3 against Aeromonas hydrophila NJ-35 extracted from the Potentilla chinensis Ser. (Wei Ling Cai)

✓ نویسندگان:

Li Z., He L., He L., Chen F., Song S., Zhang H., Sun W., Bao X., Zhang H., Li T., He C.

✓ خلاصه پژوهش:

Potentilla chinesis Ser. (Wei Ling Cai) was a food for humans and animals in China, as well as a traditional Chinese herb recorded in “ZhonghuaBencao”. Aeromonas hydrophila NJ-35 (NJ-35) was a bacterial pathogen associated with high mortality rate in aquaculture. The purpose of the present work was to isolate and identify the anti-bacterial components against the NJ-35 from the extract of Wei Ling Cai, as well as explore the underlying anti-bacterial mechanism. The peak 3 was the most efficient anti-bacterial component in all collected peaks, and it was identified as (1R,2S,5R,6S)-2,6-bis(3-ethyl-4-hydroxy-5-methoxyphenyl)-3,7-dioxabicyclo[3.3.0]octane (P-3) by high-resolution mass spectrometry (HRMS) and nuclear magnetic resonance (NMR). The minimum inhibition concentration (MIC) of P-3 against NJ-35 was 0.125 mg/mL. The results of sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) combined with NanoLC-ESI-MS/MS showed that, in the P-3-treated group, the proteins of phosphoglucomutase (PGM), pyruvate dehydrogenase E1 and alkyl hydroperoxide reductase subunit C (AhpC) were up-regulated, whereas, the porin and 30S ribosomal S3 were down-regulated. In addition, after the treatment of P-3, the activity of alkaline phosphatase (AKP) and the membrane permeability were increased (P < 0.01). The results of scanning electron microscope (SEM) showed that P-3 made the NJ-35 shriveled, sunken, and wrinkled. Taken together, these results suggested the P-3 might be a promising anti-bacterial agent for pharmacological research, and Wei Ling Cai could be a food-borne treatment for the A. hydrophila infection in aquaculture. © 2021 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.aquaculture.2021.736746

✓ نام ژورنال:

Aquaculture

✓ سال انتشار:

2021

✓ کلیدواژه‌ها:

Aeromonas hydrophila NJ-35 (NJ-35); Anti-bacterial activity; Anti-bacterial mechanism; Potentilla chinesis Ser. (Wei Ling Cai)

✓ عنوان پژوهش:

Investigating the potential of ZTO as an efficient and cheap SERS substrate for the identification of bacteria

✓ نویسندگان:

Zohaib A., Mateen A., Mahmood K., Ali A., Amin N.

✓ خلاصه پژوهش:

In recent years, Surface Enhanced Raman Spectroscopy (SERS) has been considered the best tool for the detection and identification of the least concentration of analytes and micro-organisms, such as bacteria. In this article, we have successfully obtained the SERS signal of Escherichia coli and Methylene Blue (MB) using Zinc Tin Oxide (ZTO) nanostructures as the SERS substrate. The ZTO SERS substrates were grown by a simple thermal evaporation method and annealed at various temperatures ranging from 600 to 800 °C before using them for bacteria identification. After the structural verification and morphological analysis using XRD and SEM, ZTO samples were used as SERS substrates for the detection of E. coli and MB by placing a drop of each solution on the ZTO. SERS data strongly identified the presence of MB and E. coli Raman peaks. Furthermore, it was found that intensity of signals (for both E. coli and MB) was found to be improved from SERS substrates that are pre-annealed at higher temperature. The intensity of Raman peaks for E. coli and MB was increased by 60 000 and 120 000 counts as the annealing temperature increased to 600 and 800 °C, respectively. An enhancement factor of 1.44 × 104 was observed for MB. Results obtained in this study indicate that zinc oxide based nanostructured SERS chips are potential candidates for rapid identification of many pathogens. © 2021 Author(s).

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1063/5.0046002

✓ نام ژورنال:

AIP Advances

✓ سال انتشار:

2021

✓ کلیدواژه‌ها:

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

Detection of bacterial colonization by the spectral changes of surface-enhanced Raman reporters

✓ **نویسندگان:**

Gorbachevskii M.V., Filatova S.V., Filimonova A.V., Kopitsyn D.S., Panchenko A.A., Vinokurov V.A., Novikov A.A.

✓ **خلاصه پژوهش:**

In times of widespread multiple antibiotic resistance, the bacterial colonization of crucial medical surfaces should be detected as fast as possible. In this work, we present the non-destructive SERS method for the detection of bacterial colonization. SERS is an excellent tool for the monitoring of suitable substances in low concentrations. The SERS substrate was prepared by the aggregation of citrate-stabilized gold nanoparticles and the adsorption of the reporters (crystal violet, thiamine, and adenine). We have tested the substrate for the detection of clinically relevant S. aureus and P. aeruginosa bacteria. The SERS spectra before and after the substrate incubation revealed the degradation of the reporter by the growing bacteria. The growth of P. aeruginosa was detected using the substrates with preadsorbed crystal violet or adenine. The suitable reporter for the detection of S. aureus remains to be discovered. The selection of the reporters resistant to exposure but easily degraded by bacteria will open the way for the in situ monitoring of bacterial colonization, thus complementing the arsenal of methods in the battle against hospital infections. © 2021 Elsevier Inc.

✓ **لینک** DOI (**استفاده برای دانلود مقاله**)

10.1016/j.bbrc.2021.01.099

✓ **نام ژورنال:**

Biochemical and Biophysical Research Communications

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

Au nanoparticles; Biosensor; P. aeruginosa; S. aureus; SERS

✓ **عنوان پژوهش:**

Modular and Single-Cell Sensors of Bacterial Ser/Thr Kinase Activity

✓ **نویسندگان:**

Zheng C.R., Singh A., Libby A., Silver P.A., Libby E.A.

✓ **خلاصه پژوهش:**

At the single-cell level, protein kinase activity is typically inferred from downstream transcriptional reporters. However, promoters are often coregulated by several pathways, making the activity of a specific kinase difficult to deconvolve. Here, we present modular, direct, and specific sensors of bacterial kinase activity, including FRET-based sensors, as well as a synthetic transcription factor based on the lactose repressor (LacI) that has been engineered to respond to phosphorylation. We demonstrate the utility of these sensors in measuring the activity of PrkC, a conserved bacterial Ser/Thr kinase, in different growth conditions from single cells to colonies. We also show that PrkC activity increases in response to a cell-wall active antibiotic that blocks the late steps in peptidoglycan synthesis (cefotaxime), but not the early steps (fosfomycin). These sensors have a modular design that should generalize to other bacterial signaling systems in the future. © 2021 American Chemical Society.

✓ **لینک DOI (استفاده برای دانلود مقاله)**

10.1021/acssynbio.1c00250

✓ **نام ژورنال:**

ACS Synthetic Biology

✓ **سال انتشار:**

2021

✓ **کلیدواژه‌ها:**

FRET; Gram-positive bacteria; LacI; phosphorylation; Ser/Thr kinase; β-lactam