✓ عنوان پژوهش:

A universal CRISPR/Cas12a-mediated AuNPs aggregation-based surface-enhanced Raman scattering (CRISPR/Cas-SERS) platform for virus gene detection

✓ نویسندگان:

Su A., Liu Y., Cao X., Xu W., Liang C., Xu S.

✓ خلاصه پژوهش:

A new gene detection platform based on surface-enhanced Raman spectroscopy (SERS) and clustered regularly interspaced short palindromic repeats (CRISPR)/Cas12a system is developed, which is applied for virus gene detections. CRISPR/Cas12a activated by CRISPR ribonucleic acid (crRNA) can recognize and lock the complementary target double-stranded deoxyribonucleic acid (dsDNA), followed by the cis-cleavage on the dsDNA and the trans-cleavage on the nearby linker single-stranded DNA (ssDNA). Target-induced trans-ssDNA cleavage leads to a failure in an aggregation behavior of the designed SERS probe pair that was bridged by the linker ssDNA, which causes the SERS intensity reduced relative to the control trial that gives much stronger SERS due to the severe aggregation state of SERS probes caused by intact linker ssDNA. This sensing method achieves the highly sensitive detections of human papillomavirus (HPV) genes in serum and pseudovirus within 40 min. The detection sensitivity of this CRISPR/Cas-SERS platform can reach pM. Owing to the flexible designs of the DNA probe and crRNA, this CRISPR/Cas-SERS sensing system is a universal gene detection tool, which can be applied for the in-vitro diagnosis field and point-of-care testing. © 2022 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.snb.2022.132295

✓ نام ژورنال:

Sensors and Actuators B: Chemical

✓ سال انتشار:

2022

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Raman Spectroscopy Applications in Grapevine: Metabolic Analysis of Plants Infected by Two Different Viruses

✓ **نویسندگان**:

Mandrile L., D'Errico C., Nuzzo F., Barzan G., Matić S., Giovannozzi A.M., Rossi A.M., Gambino G., Noris E.

✓ **خلاصه پژوهش**:

Grapevine is one of the most cultivated fruit plant among economically relevant species in the world. It is vegetatively propagated and can be attacked by more than 80 viruses with possible detrimental effects on crop yield and wine quality. Preventive measures relying on extensive and robust diagnosis are fundamental to guarantee the use of virus-free grapevine plants and to manage its diseases. New phenotyping techniques for non-invasive identification of biochemical changes occurring during virus infection can be used for rapid diagnostic purposes. Here, we have investigated the potential of Raman spectroscopy (RS) to identify the presence of two different viruses, grapevine fan leaf virus (GFLV) and grapevine rupestris stem pitting-associated virus (GRSPaV) in Vitis vinifera cv. Chardonnay. We showed that RS can discriminate healthy plants from those infected by each of the two viruses, even in the absence of visible symptoms, with accuracy up to 100% and 80% for GFLV and GRSPaV, respectively. Chemometric analyses of the Raman spectra followed by chemical measurements showed that RS could probe a decrease in the carotenoid content in infected leaves, more profoundly altered by GFLV infection. Transcriptional analysis of genes involved in the carotenoid pathway confirmed that this biosynthetic process is altered during infection. These results indicate that RS is a cutting-edge alternative for a real-time dynamic monitoring of pathogens in grapevine plants and can be useful for studying the metabolic changes ensuing from plant stresses. Copyright © 2022 Mandrile, D'Errico, Nuzzo, Barzan, Matić, Giovannozzi, Rossi, Gambino and Noris.

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

10.3389/fpls.2022.917226

✓ **نام ژورنال**:

Frontiers in Plant Science

✓ **سال انتشار**:

2022

✓ **کلیدواژه** (Keywords):

✓ **عنوان پژوهش**:

Accurate virus identification with interpretable Raman signatures by machine learning

✓ **نویسندگان**:

Ye J., Yeh Y.-T., Xue Y., Wang Z., Zhang N., Liu H., Zhang K., Ricker R., Yu Z., Roder A., Lopez N.P., Organtini L., Greene W., Hafenstein S., Lu H., Ghedin E., Terrones M., Huang S., Huang S.X.

✓ **خلاصه پژوهش**:

Rapid identification of newly emerging or circulating viruses is an important first step toward managing the public health response to potential outbreaks. A portable virus capture device, coupled with label-free Raman spectroscopy, holds the promise of fast detection by rapidly obtaining the Raman signature of a virus followed by a machine learning (ML) approach applied to recognize the virus based on its Raman spectrum, which is used as a fingerprint. We present such an ML approach for analyzing Raman spectra of human and avian viruses. A convolutional neural network (CNN) classifier specifically designed for spectral data achieves very high accuracy for a variety of virus type or subtype identification tasks. In particular, it achieves 99% accuracy for classifying influenza virus type A versus type B, 96% accuracy for classifying four subtypes of influenza A, 95% accuracy for differentiating enveloped and nonenveloped viruses, and 99% accuracy for differentiating avian coronavirus (infectious bronchitis virus [IBV]) from other avian viruses. Furthermore, interpretation of neural net responses in the trained CNN model using a full-gradient algorithm highlights Raman spectral ranges that are most important to virus identification. By correlating ML-selected salient Raman ranges with the signature ranges of known biomolecules and chemical functional groups—for example, amide, amino acid, and carboxylic acid—we verify that our ML model effectively recognizes the Raman signatures of proteins, lipids, and other vital functional groups present in different viruses and uses a weighted combination of these signatures to identify viruses. Copyright © 2022 the Author(s).

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

10.1073/pnas.2118836119

✓ **نام ژورنال**:

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

✓ **سال انتشار**:

2022

✓ **کلیدواژه** (Keywords):

✓ عنوان پژوهش:

Comparative Account of Biomolecular Changes Post Epstein Barr Virus Infection of the Neuronal and Glial Cells Using Raman Microspectroscopy

✓ نویسندگان:

Indari O., Jakhmola S., Pathak D.K., Tanwar M., Kandpal M., Mishra A., Kumar R., Jha H.C.

✓ خلاصه پژوهش:

Raman microspectroscopy is a vibrational spectroscopy technique used for investigating molecular fingerprints of a wide range of liquid or solid samples. The technique can be efficiently utilized to understand the virus-mediated cellular changes and could provide valuable insights into specific biomolecular alterations. The Epstein Barr virus (EBV) has been associated with various types of cancers as well as neurodegenerative diseases. However, EBV-mediated neurological ailments are yet underexplored in terms of biomolecular changes in neuronal and glial cells (astrocytes and microglia). In continuation of our earlier exploration of EBV-influenced glial cells, we tried to decipher biomolecular changes in EBV-infected neuronal cells using Raman microspectroscopy. Additionally, we compared the consecutive biomolecular changes observed in neuronal cells with both the glial cells. We observed that EBV infection gets differentially regulated in the neuronal cells, astrocytes, and microglia. The viral entry and initiation of infection-mediated cellular modulation could start as soon as 2 h post infection but may regulate a distinct biomolecular milieu in different time intervals. Similar to the early timespan, the 24-36 h interval could also be important for EBV to manipulate neuronal as well as glial cells as depicted from elevated biomolecular activities. At these time intervals, some common biomolecules such as proline, glucose, lactic acid, nucleotides, or cholesterol were observed in the cells. However, at these time intervals, some distinct biomolecules were also observed in each cell, such as collagen, lipid, and protein stretches in the neuronal nucleus (2-4 h); tyrosine and RNA in the astrocyte nucleus (2-4 h nucleus); and fatty acids in the microglia nucleus (24-36 h). The observed biomolecular entities could ultimately play pivotal roles in the viral usurpation of cells. We also provided insights into whether these biomolecular changes can be correlated to each other and mediate virus-associated manifestations which can be linked to neurological complications. Our study aids in the understanding of EBV-mediated biomolecular changes in the various compartments of the central nervous system. © 2022 American Chemical Society. All rights reserved.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acschemneuro.2c00081

✓ نام ژورنال:

ACS Chemical Neuroscience

✓ سال انتشار:

2022

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Surface-enhanced Raman scattering-based immunoassay for severe acute respiratory syndrome coronavirus 2

✓ **نویسندگان**:

Cha H., Kim H., Joung Y., Kang H., Moon J., Jang H., Park S., Kwon H.-J., Lee I.-C., Kim S., Yong D., Yoon S.-W., Park S.-G., Guk K., Lim E.-K., Park H.G., Choo J., Jung J., Kang T.

✓ **خلاصه پژوهش**:

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has affected humans worldwide for over a year now. Although various tests have been developed for the detection of SARS-CoV-2, advanced sensing methods are required for the diagnosis, screening, and surveillance of coronavirus disease 2019 (COVID-19). Here, we report a surface-enhanced Raman scattering (SERS)-based immunoassay involving an antibody pair, SERS-active hollow Au nanoparticles (NPs), and magnetic beads for the detection of SARS-CoV-2. The selected antibody pair against the SARS-CoV-2 antigen, along with the magnetic beads, facilitates the accurate direct detection of the virus. The hollow Au NPs exhibit strong, reproducible SERS signals, allowing sensitive quantitative detection of SARS-CoV-2. This assay had detection limits of 2.56 fg/mL for the SARS-CoV-2 antigen and 3.4 plaque-forming units/mL for the SARS-CoV-2 lysates. Furthermore, it facilitated the identification of SARS-CoV-2 in human nasopharyngeal aspirates and diagnosis of COVID-19 within 30 min using a portable Raman device. Thus, this assay can be potentially used for the diagnosis and prevention of COVID-19. © 2022 The Authors

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

10.1016/j.bios.2022.114008

✓ **نام ژورنال**:

Biosensors and Bioelectronics

✓ **سال انتشار**:

2022

✓ **کلیدواژه** (Keywords):

✓ **عنوان پژوهش**:

Stimulated Raman Scattering in Suspensions of Alternanthera Mosaic Virus and Potato Virus X in the Frequency Range of 1–15 GHz

✓ **نویسندگان**:

Bunkin A.F., Fedorov A.N., Davydov M.A., Arkhipenko M.V., Nikitin N.A., Pershin S.M.

✓ **خلاصه پژوهش**:

Low-frequency stimulated Raman spectra in suspensions of Alternanthera mosaic virus and Potato virus X are calculated and measured. The discrepancy between the calculated and measured frequencies of the Raman lines for the Potato virus X is attributed to the difference in the mechanical properties of the viruses, in particular, Young's modulus, in the native environment and when measured with an atomic force microscope. Differences are recorded in the stimulated Raman spectra of these viruses, allowing them to be identified. © 2022, Pleiades Publishing, Inc.

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

10.1134/S002136402210037X

✓ **نام ژورنال**:

JETP Letters

✓ **سال انتشار**:

2022

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Using a Biosensor Based on Surface-Enhanced Raman Scattering to Identify Influenza Viruses in Biological Fluids

✓ **نویسندگان**:

Zhdanov G.A., Gribanyov D.A., Gambaryan A.S., Kukushkin V.I., Zavyalova E.G.

✓ **خلاصه پژوهش**:

Abstract: Biosensors based on the effect of surface-enhanced Raman scattering obtained on silver nanoclusters modified with DNA aptamers allow viruses to be detected with high sensitivity. However, measurements in biological media are complicated by the nonspecific sorption of biomolecules on silver. Conditions for preparing samples of biological fluids that allow the nonspecific sorption of biomolecules to be nullified are studied. © 2022, Allerton Press, Inc.

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

10.3103/S1062873822040293

✓ **نام ژورنال**:

Bulletin of the Russian Academy of Sciences: Physics

✓ **سال انتشار**:

2022

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Charge mechanism of low-frequency stimulated Raman scattering on viruses

✓ **نویسندگان**:

Oshurko V.B., Karpova O.V., Davydov M.A., Fedorov A.N., Bunkin A.F., Pershin S.M., Grishin M.Y.

✓ **خلاصه پژوهش**:

A physical mechanism of stimulated light scattering on nanoscale objects in a water suspension is proposed. The proposed mechanism is based on the dipole interaction between the light wave and the inevitable uncompensated electrical charge on a nanoscale object (e.g., a virus or nanoparticle) in a water environment. Experimental data on the tobacco mosaic virus are presented to support the proposed physical mechanism. It is demonstrated that stimulated amplification spectral line frequencies observed experimentally are well explained by the proposed mechanism. In particular, the absence of lower-frequency lines and the shifting of generation lines when the pH changes are due to ion friction in the ionic solution environment. The selection rules observed experimentally also confirm the dipole interaction type. It is shown that microwave radiation on the nanoscale object acoustic vibrations frequency should appear under such scattering conditions. We demonstrate that such conditions also allow for local selective heating of nanoscale objects from dozens to hundreds of degrees Celsius. This effect is controlled by the optical irradiation parameters, and it can be used to selectively affect a specific type of virus. © 2022 American Physical Society.

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

10.1103/PhysRevA.105.043513

✓ **نام ژورنال**:

Physical Review A

✓ **سال انتشار**:

2022

✓ **کلیدواژه** (Keywords):

✓ عنوان پژوهش:

Noninvasive and Point-of-Care Surface-Enhanced Raman Scattering (SERS)-Based Breathalyzer for Mass Screening of Coronavirus Disease 2019 (COVID-19) under 5 min

✓ نویسندگان:

Leong S.X., Leong Y.X., Tan E.X., Sim H.Y.F., Koh C.S.L., Lee Y.H., Chong C., Ng L.S., Chen J.R.T., Pang D.W.C., Nguyen L.B.T., Boong S.K., Han X., Kao Y.-C., Chua Y.H., Phan-Quang G.C., Phang I.Y., Lee H.K., Abdad M.Y., Tan N.S., Ling X.Y.

✓ خلاصه پژوهش:

Population-wide surveillance of COVID-19 requires tests to be quick and accurate to minimize community transmissions. The detection of breath volatile organic compounds presents a promising option for COVID-19 surveillance but is currently limited by bulky instrumentation and inflexible analysis protocol. Here, we design a hand-held surface-enhanced Raman scattering-based breathalyzer to identify COVID-19 infected individuals in under 5 min, achieving >95% sensitivity and specificity across 501 participants regardless of their displayed symptoms. Our SERS-based breathalyzer harnesses key variations in vibrational fingerprints arising from interactions between breath metabolites and multiple molecular receptors to establish a robust partial least-squares discriminant analysis model for high throughput classifications. Crucially, spectral regions influencing classification show strong corroboration with reported potential COVID-19 breath biomarkers, both through experiment and in silico. Our strategy strives to spur the development of next-generation, noninvasive human breath diagnostic toolkits tailored for mass screening purposes. © 2022 American Chemical Society

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acsnano.1c09371

✓ نام ژورنال:

ACS Nano

✓ سال انتشار:

2022

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Synergistic surface-enhanced Raman scattering effect to distinguish live SARS-CoV-2 S pseudovirus

✓ **نویسندگان**:

Sitjar J., Xu H.-Z., Liu C.-Y., Wang J.-R., Liao J.-D., Tsai H.-P., Lee H., Liu B.H., Chang C.-W.

✓ **خلاصه پژوهش**:

The COVID-19 pandemic negatively affected the economy and health security on a global scale, causing a drastic change on lifestyle, calling a need to mitigate further transmission of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus. Surface-enhanced Raman spectroscopy (SERS) has shown great potential in the sensitive and rapid detection of various molecules including viruses, through the identification of characteristic peaks of their outer membrane proteins. Accurate detection can be developed through the synergistic integration effect among SERS-active substrate, the appropriate laser wavelength, and the target analyte. In this study, gold nanocavities (Au NC) and Au nanoparticles upon ZrO2 nano-bowls (Au NPs/pZrO2) were tested and used as SERS-active substrates in detecting SARS-CoV-2 pseudovirus containing S protein as a surface capsid glycoprotein (SARS-CoV-2 S pseudovirus) and vesicular stomatitis virus G (VSV-G) pseudo-type lentivirus (VSV-G pseudovirus) to demonstrate their virus detection capability. The optimized Au NCs and Au NPs/pZrO2 substrates were then verified by examining the repetition of measurement, reproducibility, and detection limit. Due to the difference in geometry and composition of the substrates, the characteristic peak-positions of live SARS-CoV-2 S and VSV-G pseudoviruses in the obtained Raman spectra vary, which were also compared with those of inactivated ones. Based on the experimental results, SERS mechanism of each substrate to detect virus is proposed. The formation of hot spots brought by the synergistic integration effect among substrate, analyte, and laser induction may result differences in the obtained SERS spectra. © 2021 Elsevier B.V.

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

10.1016/j.aca.2021.339406

✓ **نام ژورنال**:

Analytica Chimica Acta

✓ **سال انتشار**:

2022

✓ **کلیدواژه** (Keywords):

✓ **عنوان پژوهش**:

Magnetic-Responsive Surface-Enhanced Raman Scattering Platform with Tunable Hot Spot for Ultrasensitive Virus Nucleic Acid Detection

✓ **نویسندگان**:

Yin B., Ho W.K.H., Zhang Q., Li C., Huang Y., Yan J., Yang H., Hao J., Wong S.H.D., Yang M.

✓ **خلاصه پژوهش**:

Surface-enhanced Raman scattering (SERS)-based biosensors are promising tools for virus nucleic acid detection. However, it remains challenging for SERS-based biosensors using a sandwiching strategy to detect long-chain nucleic acids such as nucleocapsid (N) gene of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) because the extension of the coupling distance (CD) between the two tethered metallic nanostructures weakens electric field and SERS signals. Herein, we report a magnetic-responsive substrate consisting of heteoronanostructures that controls the CD for ultrasensitive and highly selective detection of the N gene of SARS-CoV-2. Significantly, our findings show that this platform reversibly shortens the CD and enhances SERS signals with a 10-fold increase in the detection limit from 1 fM to 100 aM, compared to those without magnetic modulation. The optical simulation that emulates the CD shortening process confirms the CD-dependent electric field strength and further supports the experimental results. Our study provides new insights into designing a stimuli-responsive SERS-based platform with tunable hot spots for long-chain nucleic acid detection. © 2022 American Chemical Society

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

10.1021/acsami.1c21173

✓ **نام ژورنال**:

ACS Applied Materials and Interfaces

✓ **سال انتشار**:

2022

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Surface-enhanced Raman spectroscopy substrate based on silver/titanium dioxide nanocomposites and demonstration on rhodamine 6G and severe acute respiratory syndrome coronavirus 2 spike-1 protein

✓ **نویسندگان**:

Bai C., Niu Q., Yang G., Zhang G., Yang Y.

✓ **خلاصه پژوهش**:

An excellent enhancement performance surface-enhanced Raman spectroscopy substrate with high sensitivity and repeatability was fabricated to meet the real-time detection of acute respiratory syndrome coronavirus 2 spike-1 protein. The substrate based on silver/titanium dioxide nanocomposites is synthesized by hydrothermal and magnetron sputtering methods on titanium foil, which is characterized by X-ray powder diffraction and scanning electron microscope and employed on rhodamine 6G and spike-1 protein to get the limit of detection with 10−8 M and 10 ng/mL, respectively. It is found that the sensitivity can be effectively enhanced with dropwise condensation by exploring the effects of freezing treatment and the evaporation process. © 2022 Taylor & Francis Group, LLC.

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

10.1080/00387010.2022.2085751

✓ **نام ژورنال**:

Spectroscopy Letters

✓ **سال انتشار**:

2022

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Surface-enhanced Raman effect of new coronavirus S protein in gold nanoparticles [新型冠状病毒S蛋白在金纳米粒子中的表面增强拉曼效应]

✓ نویسندگان:

Le W., Huang J., Yang Q., Qi D., Ni S., Wei L., Fan Q., Yang Y., Wen J., Mo W., Chen G., Zhao S., He Z., Li B., Du K.

✓ خلاصه پژوهش:

Surface-enhanced Raman spectroscopy (SERS) technology has been widely used in viral molecular detection due to its high sensitivity, simple operation and rapid detection. The research of virus detection by Raman technology at home and abroad mainly focuses on the detection of the SERS spectrum of viral nucleic acids and various bases that make up the nucleic acids, and detection of viral proteins is rare. In this paper, the S protein of the new coronavirus (SARS-CoV-2) is used as the detection object, and with the label-free SERS detection method, the ordinary Raman spectra of solid and saturated liquid S protein of the SARS-CoV-2 and the SERS spectra of the low-concentration S protein of SARS-CoV-2 on the substrate of gold nanoparticles with a size of 40 nm are compared. The results show that it is completely feasible to use SERS technology to detect the S protein of SARS-CoV-2 on the substrate of 40 nm gold nanoparticles. The carboxyl groups in the S protein molecule of SARS-CoV-2 and gold nanoparticles are molecularly enhanced, and the amino groups and gold nanoparticles are electromagnetically enhanced, so that the Raman effect of the S protein of the SARS-CoV-2 is enhanced and the peak position is moved to a certain extent. The experiments obtained relatively good SERS spectra of the low-concentration S protein of SARS-CoV-2, which provides a method for the establishment of a sensitive, specific and rapid detection technology for the S protein of the SARS-CoV-2. © 2021, Editorial Office of High Power Laser and Particle Beams. All right reserved.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.11884/HPLPB202133.210466

✓ نام ژورنال:

Qiangjiguang Yu Lizishu/High Power Laser and Particle Beams

✓ سال انتشار:

2021

✓ کلیدواژه (Keywords):

✓ **عنوان پژوهش**:

Raman spectroscopy for virus detection and the implementation of unorthodox food safety

✓ **نویسندگان**:

Huang C.-C., Hsu Z.-H., Lai Y.-S.

✓ **خلاصه پژوهش**:

Background: Food-mediated transmission of pathological viruses is an enduring issue in food safety and public health. The globalization of manufacturing and supply chains has worsened the situation. A containable food-related disease, if not sensed early, could quickly escalate into a global calamity. To control the spread of these infectious diseases, especially when their route of transmission is unknown, timely detection of the causal virus for determining its origin and accurate diagnosis is as crucial as, if not more than medical interventions. The challenges for the developers of such detection methods are sensitivity, specificity, and beyond. Scope and approach: Raman spectroscopy provides characteristic information of molecular vibrations for analytes ranging from small molecules to biological compounds and cells. The sensitivity of Raman spectroscopy has improved over time. Confocal Raman technique, surface-enhanced Raman scattering, and coherent anti-Stokes Raman scattering are now available for use in food inspection. We conduct a systematic and comprehensive survey of recent studies on Raman spectroscopic techniques aimed at detecting viruses. Reports relating to the implementation of food safety, either intended or incidental, are selected and reviewed. The basic concepts of the involved Raman techniques are described and compared. And their applications to specific viruses and diseases are summarized. Key findings and conclusion: The detection of viruses by Raman scattering takes either the nanotag or label-free approach. The competitive advantages of Raman spectroscopy allow rapid acquisition of spectral data, with minimal sample preparation and the applicability to point-of-care testing. Some of the reviewed methods are highly sophisticated. However, neither approach is free from limits. The emerging challenges and perspectives of the further development of Raman spectroscopic techniques in food-adherent pathogen testing are discussed and concluded.
© 2021

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

10.1016/j.tifs.2021.08.008

✓ **نام ژورنال**:

Trends in Food Science and Technology

✓ **سال انتشار**:

2021

✓ **کلیدواژه** (Keywords):

✓ **عنوان پژوهش**:

Ultra-fast and onsite interrogation of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) in waters via surface enhanced Raman scattering (SERS)

✓ **نویسندگان**:

Zhang D., Zhang X., Ma R., Deng S., Wang X., Wang X., Zhang X., Huang X., Liu Y., Li G., Qu J., Zhu Y., Li J.

✓ **خلاصه پژوهش**:

The outbreak of coronavirus infectious disease-2019 (COVID-19) pneumonia challenges the rapid interrogation of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in human and environmental samples. In this study, we developed an assay using surface enhanced Raman scattering (SERS) coupled with multivariate analysis to detect SARS-CoV-2 in an ultra-fast manner without any pretreatment (e.g., RNA extraction). Using silver-nanorod SERS array functionalized with cellular receptor angiotensin-converting enzyme 2 (ACE2), we obtained strong SERS signals of ACE2 at 1032, 1051, 1089, 1189, 1447 and 1527 cm−1. The recognition and binding of receptor binding domain (RBD) of SARS-CoV-2 spike protein on SERS assay significantly quenched the spectral intensities of most peaks and exhibited a shift from 1189 to 1182 cm−1. On-site tests on 23 water samples with a portable Raman spectrometer proved its accuracy and easy-operation for spot detection of SARS-CoV-2 to evaluate disinfection performance, explore viral survival in environmental media, assess viral decay in wastewater treatment plant and track SARS-CoV-2 in pipe network. Our findings raise a state-of-the-art spectroscopic tool to screen and interrogate viruses with RBD for human cell entry, proving its feasibility and potential as an ultra-fast detection tool for wastewater-based epidemiology. © 2021 Elsevier Ltd

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

10.1016/j.watres.2021.117243

✓ **نام ژورنال**:

Water Research

✓ **سال انتشار**:

2021

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Molybdenum Trioxide Quantum Dot-Encapsulated Nanogels for Virus Detection by Surface-Enhanced Raman Scattering on a 2D Substrate

✓ نویسندگان:

Achadu O.J., Abe F., Li T.-C., Khoris I.M., Lee D., Lee J., Suzuki T., Park E.Y.

✓ خلاصه پژوهش:

The use of nanogels (NGs) to modulate surface-enhanced Raman scattering (SERS) activities is introduced as an innovative strategy to address certain critical issues with SERS-based immunoassays. This includes the chemical deformation of SERS nanotags, as well as their nonspecific interactions and effective "hotspots"formation. Herein, the polymeric cocoon and stimuli-responsive properties of NGs were used to encapsulate SERS nanotags containing plasmonic molybdenum trioxide quantum dots (MoO3-QDs). The pH-controlled release of the encapsulated nanotags and their subsequent localization by maleimide-functionalized magnetic nanoparticles facilitated the creation of "hotspots"regions with catalyzed SERS activities. This approach resulted in developing a biosensing platform for the ultrasensitive immunoassays of hepatitis E virus (HEV) or norovirus (NoV). The immunoassays were optimized using the corresponding virus-like particles to attain limits of detection of 6.5 and 8.2 fg/mL for HEV-LPs and NoV-LPs, respectively. The SERS-based technique achieved a signal enhancement factor of up to ~108 due to the combined electromagnetic and chemical mechanisms of the employed dual-SERS substrate of MoO3-QDs/2D hexagonal boron nitride nanosheets. The highlight and validation of the developed SERS-based immunoassays was the detection of NoV in infected patients' fecal specimen and clinical HEV G7 subtype. Importantly, this system can be used to maintain the stability of SERS nanotags and improve their reliability in immunoassays. © 2021 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acsami.1c04793

✓ نام ژورنال:

ACS Applied Materials and Interfaces

✓ سال انتشار:

2021

✓ کلیدواژه (Keywords):

✓ **عنوان پژوهش**:

Potential of Spatially Offset Raman Spectroscopy for Detection of Zebra Chip and Potato Virus y Diseases of Potatoes (Solanum tuberosum)

✓ **نویسندگان**:

Farber C., Sanchez L., Pant S., Scheuring D., Vales I., Mandadi K., Kurouski D.

✓ **خلاصه پژوهش**:

Potato (Solanum tuberosum L.) is a staple food crop and part of an industry valued at an estimated $3.77 billion in the United States. Many varieties of potato are susceptible to zebra chip disease (ZC), a psyllid-vectored bacterial infection that renders the tubers unmarketable due to unappealing discoloration and taste. Similarly, potato virus Y (PVY) is a major pathogen of potatoes and other solanaceous crops that causes devastating damage to both foliage and tubers. These diseases are typically detected by enzyme-linked immunosorbent assay or polymerase chain reaction. ZC can also be diagnosed by a visual inspection of cut open tubers followed by frying to reveal the characteristic striping symptoms. However, these methods are invasive and destructive, as well as reagent, time, and labor consuming. Thus, quick and sample-general alternative methods for disease detection are highly desirable. In this proof-of-principle work, we demonstrate that spatially offset Raman spectroscopy (SORS) shows great potential for rapid and reagent-free detection of ZC or PVY diseases. Such detection is based on Raman identification of chemical changes in tubers associated with ZC or PVY. Chemometric analysis of spectra from intact potato tubers demonstrated over 90% accuracy of ZC detection. With data from cut open tubers, the prediction accuracy for ZC increased to over 90% for the prediction of PVY disease. We also show that potatoes from plants with either ZC or PVY diseases can be distinguished from each other and healthy tubers with approximately 95% accuracy. These results suggest that SORS has potential for noninvasive diagnostics of potato diseases. ©

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

10.1021/acsagscitech.1c00024

✓ **نام ژورنال**:

ACS Agricultural Science and Technology

✓ **سال انتشار**:

2021

✓ **کلیدواژه** (Keywords):

✓ عنوان پژوهش:

Applicability of Raman spectroscopy on porcine parvovirus and porcine circovirus type 2 detection

✓ نویسندگان:

Gogone I.C.V.P., Ferreira G.H., Gava D., Schaefer R., de Paula-Lopes F.F., Rocha R.D.A., de Barros F.R.O.

✓ خلاصه پژوهش:

Porcine parvovirus (PPV) is one of the major infectious causes of reproductive failure of swine. This disease is characterized by embryonic and fetal infection and death, responsible for important economic losses. PPV is also implicated as a trigger in the development of post-weaning multisystemic wasting syndrome (PMWS) caused by Porcine circovirus type 2 (PCV2). Their detection is PCR-based, which is quite sensitive and specific, but laborious, costly and time-demanding. Therefore, this study aimed to assess Raman spectroscopy (RS) as a diagnostic tool for PPV and PCV2 due to its label-free properties and unique ability to search and identify molecular fingerprints. Briefly, swine testis (ST) cells were inoculated with PPV or PCV2 and in vitro cultured (37 °C, 5% CO2) for four days. Fixed cells were then submitted to RS investigation using a 633 nm laser. A total of 225 spectra centered at 1300 cm−1 was obtained for each sample (5 spectra/cell; 15 cells/replicate; 3 replicates) of PPV-, PCV2-infected and uninfected (control) ST cells. Clear statistical discrimination between samples from both virus-infected cells was achieved with a Principal Component – Linear Discriminant Analysis (PCA-LDA) model, reaching sensitivity rates from 95.55% to 97.77%, respectively to PCV2- and PPV-infected cells. These results were then submitted to a Leave-One-Out (LOO) validation algorithm resulting in 99.97% of accuracy. Extensive band assignment was analyzed and compiled for better understanding of PPV and PCV2 virus-cell interaction, demonstrating that specific protein, lipids and DNA/RNA bands are the most important assignments related to discrimination of virus-infected from uninfected cells. In conclusion, these results represent promising bases for RS application on PCV2 and PPV detection for future diagnostic applications. © 2020 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.saa.2020.119336

✓ نام ژورنال:

Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy

✓ سال انتشار:

2021

✓ کلیدواژه (Keywords):

✓ **عنوان پژوهش**:

Stimulated Low-Frequency Raman Scattering in Brome Mosaic Virus

✓ **نویسندگان**:

Karpova O.V., Arkhipenko M.V., Pershin S.M., Karpov M.A., Kudryavtseva A.D., Mironova T.V., Savichev V.I., Shevchenko M.A., Tcherniega N.V., Umanskaya S.F.

✓ **خلاصه پژوهش**:

We experimentally register stimulated low-frequency Raman scattering (SLFRS) in the suspension of brome mosaic virus (BMV) in phosphate buffer with very high conversion efficiency. We identify two components of the SLFRS spectrum as the breathing and quadrupole modes of BMV and determine damping characteristics and gain factors for these modes. We show that, using the core–shell model for BMV and taking into account the influence of the environment, the acoustic properties of individual components of such a composite nanosystem can be determined. Thus, we define the sound velocity in the RNA core of BMV, in view of spectral characteristics of SLFRS. © 2021, Springer Science+Business Media, LLC, part of Springer Nature.

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

10.1007/s10946-020-09935-0

✓ **نام ژورنال**:

Journal of Russian Laser Research

✓ **سال انتشار**:

2021

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Rapid and sensitive detection of rotavirus by surface-enhanced Raman scattering immunochromatography

✓ **نویسندگان**:

Zhang Y., Wu G., Wei J., Ding Y., Wei Y., Liu Q., Chen H.

✓ **خلاصه پژوهش**:

A surface-enhanced Raman scattering (SERS) immunochromatographic assay (ICA) has been developed for rapid, ultrasensitive, and quantitative detection of rotavirus in feces using double Raman molecule-labeled Au-core Ag-shell nanoparticles. The Raman signals are generated by 5,5′-dithiobis-(2-nitrobenzoic acid) and the intensity of the characteristic peak at 1334−1 cm was detected as the analytical signal. The Raman signals were enhanced by the SERS-enhanced effect of both Au and Ag, the large amount of Raman molecules, and the hot-spot effect in the narrow gap between the Au core and Ag shell. The SERS ICA can quantitatively detect rotavirus in a concentration range of 8- 40,000 pg/mL, with detection limits of 80 pg/mL and 8 pg/mL based on naked eye observation and SERS signal detection, respectively. No cross-reaction was observed from other common pathogens. The standard deviation of the intra- and inter-batch repetitive tests is less than 10%, and the coincidence between SERS ICA and RT-qPCR as well as commercial colloidal gold ICA is 100%. The results indicated that this SERS ICA is able to quantitatively detect rotavirus in feces in 20 min with high sensitivity, selectivity, reproducibility, and accuracy and might be a promising method for the early detection of rotavirus in clinical analysis. Graphical abstract: [Figure not available: see fulltext.]. © 2021, Springer-Verlag GmbH Austria, part of Springer Nature.

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

10.1007/s00604-020-04670-4

✓ **نام ژورنال**:

Microchimica Acta

✓ **سال انتشار**:

2021

✓ **کلیدواژه** (Keywords):

✓ عنوان پژوهش:

Temporal in Vitro Raman Spectroscopy for Monitoring Replication Kinetics of Epstein-Barr Virus Infection in Glial Cells

✓ نویسندگان:

Tiwari D., Jakhmola S., Pathak D.K., Kumar R., Jha H.C.

✓ خلاصه پژوهش:

Raman spectroscopy can be used as a tool to study virus entry and pathogen-driven manipulation of the host efficiently. To date, Epstein-Barr virus (EBV) entry and altered biochemistry of the glial cell upon infection are elusive. In this study, we detected biomolecular changes in human glial cells, namely, HMC-3 (microglia) and U-87 MG (astrocytes), at two variable cellular locations (nucleus and periphery) by Raman spectroscopy post-EBV infection at different time points. Two possible phenomena, one attributed to the response of the cell to viral attachment and invasion and the other involved in duplication of the virus followed by egress from the host cell, are investigated. These changes corresponded to unique Raman spectra associated with specific biomolecules in the infected and the uninfected cells. The Raman signals from the nucleus and periphery of the cell also varied, indicating differential biochemistry and signaling processes involved in infection progression at these locations. Molecules such as cholesterol, glucose, hyaluronan, phenylalanine, phosphoinositide, etc. are associated with the alterations in the cellular biochemical homeostasis. These molecules are mainly responsible for cellular processes such as lipid transport, cell proliferation, differentiation, and apoptosis in the cells. Raman signatures of these molecules at distinct time points of infection indicated their periodic involvement, depending on the stage of virus infection. Therefore, it is possible to discern the details of variability in EBV infection progression in glial cells at the biomolecular level using time-dependent in vitro Raman scattering. ©

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acsomega.0c04525

✓ نام ژورنال:

ACS Omega

✓ سال انتشار:

2020

✓ کلیدواژه (Keywords):

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

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Label-free detection of high-risk human papillomaviruses infection using Raman spectroscopy and multivariate analysis

✓ نویسندگان:

Zheng X., Wang J., Yin L., Luo B., Lv X., Wu G.

✓ خلاصه پژوهش:

Persistent infection with high-risk human papillomavirus (HR-HPV) is considered as the leading cause of pre-cervical cancer and cancer. Currently, HPV testing is expensive, time-consuming, and requires experienced technicians. Here, we report a method for label-free detection of HR-HPV by recording and analyzing Raman spectroscopy (RS) of cervical exfoliated cell specimens. A total of 315 Raman spectra (165 normal, 150 HR-HPV) were recorded from 63 subjects (33 normal samples, 30 HR-HPV positive patients). Mean Raman spectra differed significantly between normal and HR-HPV positive groups. The differences showed an increase in the relative contents of hemoglobin and tryptophan, and new peaks appeared due to cell-level infection in HR-HPV positive group. Furthermore, a principal component analysis-linear discriminant analysis diagnostic model was developed and applied on the Raman spectra of HR-HPV positive patients as well as normal samples, and satisfactory classification results were obtained. Raman diagnostic performance was evaluated through the leave-one-spectrum-out cross-validation (LOSOCV) or leave-one-patient-out cross-validation (LOPOCV) method. The diagnostic accuracy, sensitivity and specificity of LOSOCV and LOPOCV were 99.4%, 99.4%, 99.3% and 98.4%, 100%, 96.7%, respectively. Interestingly, the use of LOSOCV or LOPOCV method yielded similar classification results. The results showed that the use of multiple data points from the same sample would not lead to biases necessarily impacting the reliability of the classification models. Furthermore, our exploratory work demonstrated that RS combined with multivariate analysis might provide a new method for clinical detection of patients with HR-HPV infection. © 2020 Astro Ltd

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1088/1612-202X/abafbf

✓ نام ژورنال:

Laser Physics Letters

✓ سال انتشار:

2020

✓ کلیدواژه (Keywords):

Detect Precisely

✓ **عنوان پژوهش**:

Raman spectroscopy-based detection of RNA viruses in saliva: A preliminary report

✓ **نویسندگان**:

Desai S., Mishra S.V., Joshi A., Sarkar D., Hole A., Mishra R., Dutt S., Chilakapati M.K., Gupta S., Dutt A.

✓ **خلاصه پژوهش**:

Several non-invasive Raman spectroscopy-based assays have been reported for rapid and sensitive detection of pathogens. We developed a novel statistical model for the detection of RNA viruses in saliva, based on an unbiased selection of a set of 65 Raman spectral features that mostly attribute to the RNA moieties, with a prediction accuracy of 91.6% (92.5% sensitivity and 88.8% specificity). Furthermore, to minimize variability and automate the downstream analysis of the Raman spectra, we developed a GUI-based analytical tool “RNA Virus Detector (RVD).” This conceptual framework to detect RNA viruses in saliva could form the basis for field application of Raman Spectroscopy in managing viral outbreaks, such as the ongoing COVID-19 pandemic. (http://www.actrec.gov.in/pi-webpages/AmitDutt/RVD/RVD.html). © 2020 WILEY-VCH GmbH

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

10.1002/jbio.202000189

✓ **نام ژورنال**:

Journal of Biophotonics

✓ **سال انتشار**:

2020

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Molybdenum Trioxide Nanocubes Aligned on a Graphene Oxide Substrate for the Detection of Norovirus by Surface-Enhanced Raman Scattering

✓ نویسندگان:

Achadu O.J., Abe F., Suzuki T., Park E.Y.

✓ خلاصه پژوهش:

A novel biosensing system based on graphene-mediated surface-enhanced Raman scattering (G-SERS) using plasmonic/magnetic molybdenum trioxide nanocubes (mag-MoO3 NCs) has been designed to detect norovirus (NoV) via a dual SERS nanotag/substrate platform. A novel magnetic derivative of MoO3 NCs served as the SERS nanotag and the immunomagnetic separation material of the biosensor. Single-layer graphene oxide (SLGO) was adopted as the 2D SERS substrate/capture platform and acted as the signal reporter, with the ability to accommodate an additional Raman molecule as a coreporter. The developed SERS-based immunoassay achieved a signal amplification of up to ~109-fold resulting from the combined electromagnetic and chemical mechanisms of the dual SERS nanotag/substrate system. The developed biosensor was employed for the detection of NoV in human fecal samples collected from infected patients by capturing the virus with the aid of NoV-specific antibody-functionalized magnetic MoO3 NCs. This approach enabled rapid signal amplification for NoV detection with this biosensing technology. The biosensor was tested and optimized using NoV-like particles within a broad linear range from 10 fg/mL to 100 ng/mL and a limit of detection (LOD) of ~5.2 fg/mL. The practical applicability of the developed biosensor to detect clinical NoV subtypes in human fecal samples was demonstrated by effective detection with an LOD of ~60 RNA copies/mL, which is ~103-fold lower than that of a commercial enzyme-linked immunosorbent assay kit for NoV. Copyright © 2020 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acsami.0c14729

✓ نام ژورنال:

ACS Applied Materials and Interfaces

✓ سال انتشار:

2020

✓ کلیدواژه (Keywords):

✓ **عنوان پژوهش**:

Optical diagnosis of hepatitis B virus infection in blood plasma using Raman spectroscopy and chemometric techniques

✓ **نویسندگان**:

Saleem M., Ali S., Khan M.B., Amin A., Bilal M., Nawaz H., Hassan M.

✓ **خلاصه پژوهش**:

The potential of Raman spectroscopy has been utilized for the diagnosis of hepatitis B virus (HBV) infection in blood plasma. Raman spectra of 24 diseased and 10 healthy samples were used to develop distinct types of support vector machine (SVM) models, including linear, quadratic, and radial basis function (RBF) using multivariate method of principal component analysis (PCA) to reduce the dimensions of the obtained datasets. To assess the diagnostic power of these algorithms, developed models were tested on independent dataset. RBF-based PCA-SVM model achieved the best performance and yielded accuracy of 98.82%, sensitivity of 98.89%, and specificity of 98.80%. The performance of the SVM models was compared with rerated chemometric method of partial least square regression (PLSR), which has been developed by using the same dataset. The PLSR model attained the diagnostic accuracy of 88%, sensitivity of 93%, and specificity of 78% for same dataset. Our developed model has established promising results compared with state-of-the-art approaches. The results reveal the improved performance of the developed chemometric techniques and clinical prediction potential of HBV by PCA-SVMs in conjunction with Raman spectroscopy. © 2020 John Wiley & Sons, Ltd.

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

10.1002/jrs.5896

✓ **نام ژورنال**:

Journal of Raman Spectroscopy

✓ **سال انتشار**:

2020

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Metabolic machinery encrypted in the Raman spectrum of influenza A virus-inoculated mammalian cells

✓ **نویسندگان**:

Pezzotti G., Zhu W., Adachi T., Horiguchi S., Marin E., Boschetto F., Ogitani E., Mazda O.

✓ **خلاصه پژوهش**:

Raman spectroscopy was applied with a high spectral resolution to a structural study of Influenza (type A) virus before and after its inoculation into Madin–Darby canine kidney cells. This study exploits the fact that the major virus and cell constituents, namely DNA/RNA, lipid, and protein molecules, exhibit peculiar fingerprints in the Raman spectrum, which clearly differed between cells and viruses, as well as before and after virus inoculation into cells. These vibrational features, which allowed us to discuss viral assembly, membrane lipid evolution, and nucleoprotein interactions of the virus with the host cells, reflected the ability of the virus to alter host cells' pathways to enhance its replication efficiency. Upon comparing Raman signals from the host cells before and after virus inoculation, we were also able to discuss in detail cell metabolic reactions against the presence of the virus in terms of compositional variations of lipid species, the formation of fatty acids, dephosphorylation of high-energy adenosine triphosphate molecules, and enzymatic hydrolysis of the hemagglutinin glycoprotein. © 2019 Wiley Periodicals, Inc.

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

10.1002/jcp.29392

✓ **نام ژورنال**:

Journal of Cellular Physiology

✓ **سال انتشار**:

2020

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Rapid and efficient screening of human papillomavirus by Raman spectroscopy based on GA-SVM

✓ **نویسندگان**:

Chen C., Wang J., Chen C., Tang J., Lv X., Ma C.

✓ **خلاصه پژوهش**:

In this study, a rapid, noninvasive and efficient screening method for human papillomavirus (HPV) was proposed by combining cervical secretion Raman spectral data with a pattern recognition algorithm. We measured the cervical secretion Raman spectra of 58 HPV positive and 196 HPV negative samples. The preliminary assignment of the Raman peaks in the measured cervical secretion spectra indicated changes in specific biomolecules between the groups, and we analyzed them according to their differences. The specificity of the airPLS-PLS-GA-SVM model was 100 %, the sensitivity was 94.4 %, and the total accuracy was 98.6 %. The results show that the combination of cervical secretion Raman spectroscopy and multivariate statistical analysis has great potential in the early screening of HPV and the samples of low-level lesions and high-level lesions were preliminarily classified effectively, providing a basis for the design of computer-aided diagnosis systems in the future. © 2020 Elsevier GmbH

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

10.1016/j.ijleo.2020.164514

✓ **نام ژورنال**:

Optik

✓ **سال انتشار**:

2020

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش:**

Mutated human p-selectin glycoprotein ligand-1 and viral protein-1 of enterovirus 71 interactions on Au nanoplasmonic substrate for specific recognition by surface-enhanced raman spectroscopy

✓ **نویسندگان:**

Sivashanmugan K., Lee H., Liao J.-D., Wang C.-C., Lin C.-H., Yang Y.-S., Sitjar J.

✓ **خلاصه پژوهش:**

Protein tyrosine sulfation is a common post-translational modification that stimulates intercellular or extracellular protein-protein interactions and is responsible for various important biological processes, including coagulation, inflammation, and virus infections. Recently, human P-selectin glycoprotein ligand-1 (PSGL-1) has been shown to serve as a functional receptor for enterovirus 71 (EV71). It has been proposed that the capsid viral protein VP1 of EV71 is directly involved in this specific interaction with sulfated or mutated PSGL-1. Surface-enhanced Raman spectroscopy (SERS) is used to distinguish PSGL-1 and VP1 interactions on an Au nanoporous substrate and identify specific VP1 interaction positions of tyrosine residue sites (46, 48, and 51). The three tyrosine sites in PSGL-1 were replaced by phenylalanine (F), as determined using SERS. A strong phenylalanine SERS signal was obtained in three regions of the mutated protein on the nanoporous substrate. The mutated protein positions at (51F) and (48F, 51F) produced a strong SERS peak at 1599-1666 cm-1, which could be related to a binding with the mutated protein and anti-sulfotyrosine interactions on the nanoporous substrate. A strong SERS effect of the mutated protein and VP1 interactions appeared at (48F), (51F), and (46F, 48F). In these positions, there was less interaction with VP1, as indicated by a strong phenylalanine signal from the mutated protein. © 2020 by the authors.

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

10.3390/coatings10040403

✓ **نام ژورنال:**

Coatings

✓ **سال انتشار:**

2020

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Quantitative analysis of hepatitis B virus DNA based on raman spectroscopy combined with multivariate statistical methods

✓ **نویسندگان**:

Du Y., Lv G., Li H., Tong D., Lv X., Zhang Z., Zheng X., Wu G.

✓ **خلاصه پژوهش**:

Quantitation of hepatitis B virus deoxyribonucleic acid (HBV DNA) is the most accurate method for determining the infection level of hepatitis B. It is a very meaningful means of detecting the different replication states of HBV infection. In this study, HBV DNA was detected and quantified in 499 patients with hepatitis B by confocal Raman spectroscopy combined with multivariate analysis. The effective information related to HBV DNA in spectral data was extracted by different pretreatments according to the vibrational modes of different functional groups. Quantitative analysis of HBV DNA was carried out by using the spectrum in the characteristic range of 807.027-1700.29 cm-1 for spectral peak assignment analysis and using partial least squares to construct a quantitative model. The results show that the regression model is established by combining normalization pretreatment and multivariate analysis methods. The correlation coefficient (R c) and root mean square error of calibration from the calibration set of the selected feature range are 0.9751 and 0.3881, and the correlation coefficient (R p) of the verification set and the root mean square error of prediction from the prediction set are 0.9673 and 0.4314. respectively. In clinical medical applications, Raman spectroscopy combined with diversified analysis methods has great research potential for the quantitative detection of HBV DNA in HBV serum. © 2020 Astro Ltd.

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

10.1088/1612-202X/ab6855

✓ **نام ژورنال**:

Laser Physics Letters

✓ **سال انتشار**:

2020

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Application of Raman spectroscopy in the detection of hepatitis B virus infection

✓ **نویسندگان**:

Tong D., Chen C., Zhang J., Lv G., Zheng X., Zhang Z., Lv X.

✓ **خلاصه پژوهش**:

Objective: Detection of hepatitis B virus (HBV) using Raman spectroscopy. Methods: Raman spectroscopy was used to examine the serum samples of 500 patients with HBV and 500 non-HBV persons. First, the adaptive iterative weighted penalty least squares method (airPLS) was used to deduct the fluorescence background in Raman spectra. Then, a principal component analysis (PCA) was used to extract the processed Raman spectra, and a support vector machine (SVM) was used for modeling and prediction. The particle swarm optimization (PSO) algorithm was selected to optimize the parameters of the SVM instead of a traditional grid search. Finally, 600 serum samples were detected by Raman spectroscopy, and the results wereverified using a double-blind method. Results: In the Raman spectra, the non-HBV human Raman peaks at 509, 957, 1002, 1153, 1260, 1512, 1648 and 2305 cm−1 were different from those of patients with HBV. The reported accuracy, sensitivity and specificity of the HBV serum model established using airPLS-PCA-PSO-SVM was 93.1%, 100% and 88%, respectively. The two groups were verified by a double-blind method. In the first group sensitivity was 87%, specificity was 92%, and the KAPPA value was 0.79; in the second group sensitivity was 80%, specificity was 79%, and the KAPPA value was 0.59. Conclusion: This preliminary study shows that serum Raman spectroscopy combined with the airPLS-PCA-PSO-SVM model can be used for hepatitis B virus detection. © 2019 Elsevier B.V.

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

10.1016/j.pdpdt.2019.08.006

✓ **نام ژورنال**:

Photodiagnosis and Photodynamic Therapy

✓ **سال انتشار**:

2019

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Diagnosis of tamiflu-resistant influenza virus in human nasal fluid and saliva using surface-enhanced raman scattering

✓ **نویسندگان**:

Eom G., Hwang A., Kim H., Yang S., Lee D.K., Song S., Ha K., Jeong J., Jung J., Lim E.-K., Kang T.

✓ **خلاصه پژوهش**:

Influenza viruses cause respiratory infection, spread through respiratory secretions, and are shed into the nasal secretion and saliva specimens. Therefore, nasal fluid and saliva are effective clinical samples for the diagnosis of influenza virus-infected patients. Although several methods have been developed to detect various types of influenza viruses, approaches for detecting mutant influenza viruses in clinical samples are rarely reported. Herein, we report for the first time a surface-enhanced Raman scattering (SERS)-based sensing platform for oseltamivir-resistant pandemic H1N1 (pH1N1) virus detection in human nasal fluid and saliva. By combining SERS-active urchin Au nanoparticles and oseltamivir hexylthiol, an excellent receptor for the pH1N1/H275Y mutant virus, we detected the pH1N1/H275Y virus specifically and sensitively in human saliva and nasal fluid samples. Considering that the current influenza virus infection testing methods do not provide information on the antiviral drug resistance of the virus, the proposed SERS-based diagnostic test for the oseltamivir-resistant virus will inform clinical decisions about the treatment of influenza virus infections, avoiding the unnecessary prescription of ineffective drugs and greatly improving therapy. Copyright © 2019 American Chemical Society.

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

10.1021/acssensors.9b00697

✓ **نام ژورنال**:

ACS Sensors

✓ **سال انتشار**:

2019

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Nondestructive Raman Spectroscopy as a Tool for Early Detection and Discrimination of the Infection of Tomato Plants by Two Economically Important Viruses

✓ نویسندگان:

Mandrile L., Rotunno S., Miozzi L., Vaira A.M., Giovannozzi A.M., Rossi A.M., Noris E.

✓ خلاصه پژوهش:

Global population forecasts dictate a rapid adoption of multifaceted approaches to fulfill increasing food requirements, ameliorate food dietary value and security using sustainable and economically feasible agricultural processes. Plant pathogens induce up to 25% losses in vegetable crops and their early detection would contribute to limit their spread and economic impact. As an alternative to time-consuming, destructive, and expensive diagnostic procedures, such as immunological assays and nucleic acid-based techniques, Raman spectroscopy (RS) is a nondestructive rapid technique that generates a chemical fingerprinting of a sample, at low operating costs. Here, we assessed the suitability of RS combined to chemometric analysis to monitor the infection of an important vegetable crop plant, tomato, by two dangerous and peculiarly different viral pathogens, Tomato yellow leaf curl Sardinia virus (TYLCSV) and Tomato spotted wilt virus (TSWV). Experimentally inoculated plants were monitored over 28 days for symptom occurrence and subjected to RS analysis, alongside with measuring the virus amount by quantitative real-time PCR. RS allowed to discriminate mock inoculated (healthy) from virus-infected specimens, reaching an accuracy of >70% after only 14 days after inoculation for TYLCSV and >85% only after 8 days for TSWV, demonstrating its suitability for early detection of virus infection. Importantly, RS also highlighted spectral differences induced by the two viruses, providing specific information on the infecting agent. © 2019 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acs.analchem.9b01323

✓ نام ژورنال:

Analytical Chemistry

✓ سال انتشار:

2019

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Identification of Newly Emerging Influenza Viruses by Detecting the Virally Infected Cells Based on Surface Enhanced Raman Spectroscopy and Principal Component Analysis

✓ نویسندگان:

Lim J.-Y., Nam J.-S., Shin H., Park J., Song H.-I., Kang M., Lim K.-I., Choi Y.

✓ خلاصه پژوهش:

Rapid diagnosis and quarantine of influenza virus mutant-infected people is critical to contain the fatal viral infection spread because effective antiviral drugs are normally not available. Conventional methods, however, cannot be used for the diagnosis because these methods need predefined labels, likely also unavailable for just emerging viruses. Here, we propose label-free identification of cells infected with different influenza viruses based on surface-enhanced Raman spectroscopy (SERS) and principal component analysis (PCA). Viral envelope proteins that are displayed on the surface of cells after infection of influenza viruses were targeted for this identification. Cells that expressed the envelope proteins of A/WSN/33 H1N1 or A/California/04/2009 H1N1 influenza viruses produced distinct SERS signals. Cells that displayed combinations of the envelope proteins from these two viral variants, an indication of emergence of a new virus, also generated characteristic SERS patterns. However, the cell's own surface proteins often hindered the identification of virally infected cells by producing SERS peaks similar to viral ones. PCA of the obtained SERS patterns could effectively capture the virus-specific signal components from the jumbled SERS peaks. Our study demonstrates a potential of combination of SERS and PCA to identify newly emerging influenza viruses through sensing the cells infected with the viruses. © 2019 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acs.analchem.8b05533

✓ نام ژورنال:

Analytical Chemistry

✓ سال انتشار:

2019

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Ultrasensitive detection of avian influenza A (H7N9) virus using surface-enhanced Raman scattering-based lateral flow immunoassay strips

✓ نویسندگان:

Xiao M., Xie K., Dong X., Wang L., Huang C., Xu F., Xiao W., Jin M., Huang B., Tang Y.

✓ خلاصه پژوهش:

The development of biosensors that are portable, low-cost, and quantitative has long been sought for rapid, on-site, and timely detection of avian influenza virus (AIV). In this study, an antibody-based Raman lateral flow immunoassay strip was developed to detect AIV H7N9. This LFIA strip used a novel core-shell structure material, AuAg 4–ATP @AgNPs, as a Raman probe. An antibody specific for AIV and goat anti-mouse IgG antibody were immobilized on a nitrocellulose membrane as the test and control lines, respectively. Accumulation of antibody-virus-antibody-Raman probe complex at the test line could be visualized by the naked eye, and the Raman signal could be quantified using a portable Raman instrument. The testing process for the SERS-based LFIA strips could be completed in 20 min, which avoided the time-cost of current methods for AIV analysis. In our SERS-based biosensor, we estimated the limit of detection (LOD) for H7N9 to be 0.0018 HAU. This value is approximately three orders of magnitude more sensitive than the corresponding HA assays. When testing real sample, the results of the strip test were in accordance with those from real-time PCR testing. In conclusion, the SERS-based LFIA strip proposed in this study shows tremendous potential to detect targets quickly and sensitively using an elegantly simple method. © 2018 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.aca.2018.11.056

✓ نام ژورنال:

Analytica Chimica Acta

✓ سال انتشار:

2019

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Volume-Enhanced Raman Scattering Detection of Viruses

✓ **نویسندگان**:

Zhang X., Zhang X., Luo C., Liu Z., Chen Y., Dong S., Jiang C., Yang S., Wang F., Xiao X.

✓ **خلاصه پژوهش**:

Virus detection and analysis are of critical importance in biological fields and medicine. Surface-enhanced Raman scattering (SERS) has shown great promise in small molecule and even single molecule detection, and can provide fingerprint signals of molecules. Despite the powerful detection capabilities of SERS, the size discrepancy between the SERS “hot spots” (generally, <10 nm) and viruses (usually, sub-100 nm) yields poor detection reliability of viruses. Inspired by the concept of molecular imprinting, a volume-enhanced Raman scattering (VERS) substrate composed of hollow nanocones at the bottom of microbowls (HNCMB) is developed. The hollow nanocones of the resulting VERS substrates serve a twofold purpose: 1) extending the region of Raman signal enhancement from the nanocone surface (e.g., surface “hot spots”) to the hollow area within the cone (e.g., volume “hot spots”)—a novel method of Raman signal enhancement, and 2) directing analyte such as viruses of a wide range of sizes to those VERS “hot spots” while simultaneously increasing the surface area contributing to SERS. Using HNCMB VERS substrates, greatly improved Raman signals of single viruses are demonstrated, an achievement with important implications in disease diagnostics and monitoring, biomedical fields, as well as in clinical treatment. © 2019 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim

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

10.1002/smll.201805516

✓ **نام ژورنال**:

Small

✓ **سال انتشار**:

2019

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Raman-Enhanced Spectroscopy Distinguishes Anal Squamous Intraepithelial Lesions in Human Immunodeficiency Virus-Serodiscordant Couples

✓ **نویسندگان**:

Oda R., Agsalda-Garcia M., Loi N., Kamada N., Milne C., Killeen J., Choi S.Y., Lim E., Acosta-Maeda T., Misra A., Shiramizu B.

✓ **خلاصه پژوهش**:

HIV-positive individuals are at increased risk for precancerous anal squamous intraepithelial lesions (SILs). Anal cytology and digital rectal examination are performed as screening tools, but extensive training and appropriate instruments are required to follow up on an abnormal anal cytology. Thus, novel approaches to SIL evaluation could improve better health care follow-up by efficient and timely diagnosis to offer treatment options. Recently, Raman-enhanced spectroscopy (RESpect) has emerged as a potential new tool for early identification of SIL. RESpect is a noninvasive, label-free, laser-based technique that identifies molecular composition of tissues and cells. HIV-serodiscordant couples had anal biopsies obtained during high-resolution anoscopy. RESpect was performed on the specimens. Principal component analysis of the data identified differences between normal and abnormal tissue as well as HIV-positive and HIV-negative individuals of each couple even with similar pathologies. RESpect has the potential to change the paradigm of anal pathology diagnosis and could provide insight into different pathways leading to SIL in HIV-serodiscordant couples. © Copyright 2019, Mary Ann Liebert, Inc., publishers 2019.

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

10.1089/aid.2018.0198

✓ **نام ژورنال**:

AIDS Research and Human Retroviruses

✓ **سال انتشار**:

2019

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Raman spectroscopy insight into Norovirus encapsulation in Bombyx mori cypovirus cubic microcrystals

✓ نویسندگان:

Mori H., Oda N., Abe S., Ueno T., Zhu W., Pernstich C., Pezzotti G.

✓ خلاصه پژوهش:

Protein and amino acid structures of Norovirus-like particles (NoVLP) have been investigated by Raman spectroscopy before and after encapsulation into Bombyx mori cypovirus (BmCPV) cubic microcrystals, which are usually referred to as cubes or polyhedra. Two different types of tag were used in co-expression, namely VP3 and H1 tags. VP3 tag is derived from a capsid protein VP4 from BmCPV and H1 tag is N-terminal α-helix of BmCPV polyhedrin, respectively. A major capsid protein VP1 of NoVLP G11.4 was fused with H1 or VP3 tags, and then encapsulated into BmCPV polyhedra. Analyses of the spectroscopic data permitted the assignment of conformation-sensitive Raman bands to viral amino acid constituents and the observation of structural similarities or differences between differently tagged samples. Three separate Raman zones were attentioned, namely, the ring-mode structure region (1000–1500 cm−1), the C[dbnd]O and C[dbnd]C double-bond region and its surroundings (1500–1750 cm−1), and the high-frequency C–H stretching region (2800–3100 cm−1). Structural fingerprints could be found in specific spectral zones for differently co-expressed samples. One clear characteristic of the H1-tagged VP1 polyhedra was the increase in tyrosine fraction, which played a critical role in binding neighboring strands through its unpaired negatively charged COO– sites. This feature could consistently be detected in different regions, but it was best represented by Raman signals associated with negatively charged COO– sites and H1 helices in the double-bond region. Such peculiar chemical features were revealed by two relatively broad bands at 1570 and 1630 cm−1, which were assigned to COO– anti-symmetric stretching and amide I in 310-helix extensions to α-helices at N-termini, respectively. These specific features did not display in the spectrum of the VP3-tagged VP1 polyhedra. Concurrently, a strong reduction of C–H bond Raman signal was noticed in the high frequency stretching region of the Raman spectrum upon H1-tagged VP1 polyhedra. The Raman activity most strikingly also represented fingerprints of tagged NoVLP VP1 after its encapsulation into BmCPV polyhedra, opening thus the possibility to in situ advanced experiments in the fields of drug delivery and regenerative medicine. © 2018 Elsevier B.V.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.saa.2018.05.066

✓ نام ژورنال:

Spectrochimica Acta - Part A: Molecular and Biomolecular Spectroscopy

✓ سال انتشار:

2018

✓ کلیدواژه (Keywords):

✓ **عنوان پژوهش:**

Early detection of virus infection in live human cells using Raman spectroscopy

✓ **نویسندگان:**

Moor K., Terada Y., Taketani A., Matsuyoshi H., Ohtani K., Sato H.

✓ **خلاصه پژوهش:**

Virus infection of a human cell was determined only 3 h after invagination. We used viral vector Ad-CMV-control (AdC), which lacks the E1 gene coding for early polypeptide 1 (E1). AdC can replicate in human embryonic kidney 293 (HEK293) cells into which the E1 gene has been transfected. According to partial least-square regression discriminant analysis, it was assumed that two kinds of reaction take place in the cell during viral invasion. The first response of the cell was determined 3 h after the virus invasion, and the second one was determined ~9 h later. The first one seems to be due to compositional changes in DNA. Analysis of large-scale datasets strongly indicated that the second reaction can be attributed to a reduction in protein concentration or uptake of phenylalanine into the nucleus. © 2018 Society of Photo-Optical Instrumentation Engineers (SPIE).

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

10.1117/1.JBO.23.9.097001

✓ **نام ژورنال:**

Journal of Biomedical Optics

✓ **سال انتشار:**

2018

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Analysis of hepatitis B virus infection in blood sera using Raman spectroscopy and machine learning

✓ **نویسندگان**:

Khan S., Ullah R., Khan A., Ashraf R., Ali H., Bilal M., Saleem M.

✓ **خلاصه پژوهش**:

This study presents the analysis of hepatitis B virus (HBV) infection in human blood serum using Raman spectroscopy combined with pattern recognition technique. In total, 119 confirmed samples of HBV infected sera, collected from Pakistan Atomic Energy Commission (PAEC) general hospital have been used for the current analysis. The differences between normal and HBV infected samples have been evaluated using support vector machine (SVM) algorithm. SVM model with two different kernels i.e. polynomial function and Gaussian radial basis function (RBF) have been investigated for the classification of normal blood sera from HBV infected sera based on Raman spectral features. Furthermore, the performance of the model with each kernel function has also been analyzed with two different implementations of optimization problem i.e. Quadratic programming and least square. 5-fold cross validation method has been used for the evaluation of the model. In the current study, best classification performance has been achieved for polynomial kernel of order-2. A diagnostic accuracy of about 98% with the precision of 97%, sensitivity of 100% and specificity of 95% has been achieved under these conditions. © 2018

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

10.1016/j.pdpdt.2018.05.010

✓ **نام ژورنال**:

Photodiagnosis and Photodynamic Therapy

✓ **سال انتشار**:

2018

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Metal Carbonyls for the Biointerference-Free Ratiometric Surface-Enhanced Raman Spectroscopy-Based Assay for Cell-Free Circulating DNA of Epstein-Barr Virus in Blood

✓ **نویسندگان**:

Lin D., Gong T., Hong Z.-Y., Qiu S., Pan J., Tseng C.-Y., Feng S., Chen R., Kong K.V.

✓ **خلاصه پژوهش**:

By taking advantage of the spectral properties of metal carbonyls, we have designed a surface-enhanced Raman spectroscopy (SERS) ratiometric assay for measuring cell-free circulating DNA (cfDNA) from Epstein-Barr virus in blood for nasopharyngeal carcinoma (NPC). This assay consists of a rhenium carbonyl (Re-CO) to serve as a DNA probe, an osmium carbonyl (Os-CO) embedded within the SERS-active substrate as an internal reference, and a streptavidin layer on the surface of the substrate. Hybridization of cfDNA with biotinylated-capture sequence leads to immobilization of cfDNA on the substrate. The binding of Re-CO via daunorubicin (DNR) to cfDNA is accompanied by an appearance of a strong symmetry stretching vibrations peak at 2113 cm-1, which has spectral overlap with Os-CO (2025 cm-1). This results in an increase in the I2113/I2025 ratio and quantitatively correlates with cfDNA. This SERS assay can be readily used to detect cfDNA in blood samples from patients due to the intensity ratio of I2113/I2025 lying in a silent region (1780-2200 cm-1) in the SERS spectrum of the biomolecules. © 2018 American Chemical Society.

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

10.1021/acs.analchem.8b01931

✓ **نام ژورنال**:

Analytical Chemistry

✓ **سال انتشار**:

2018

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Stimulated low-frequency Raman scattering in plant virus suspensions

✓ **نویسندگان**:

Donchenko E.K., Karpova O.V., Kudryavtseva A.D., Pershin S.M., Savichev V.I., Strokov M.A., Tcherniega N.V., Zemskov K.I.

✓ **خلاصه پژوهش**:

The study deals with laser pulse interaction with plant viruses: we investigated tobacco mosaic virus (TMV) and two types of potato viruses (PVX and PVA) in Tris-HCl pH7.5 buffer and in water. We used 20 ns ruby laser pulses for excitation. We employed Fabry-Pérot interferometers to record spectra of the light passing through the sample and reflected from it. For TMV and PVX in Tris-HCl pH7.5 buffer, same as for PVA in water, we observed additional spectral lines corresponding to the stimulated low-frequency Raman scattering (SLFRS). We believe we were the first to measure SLFRS frequency shifts, conversion efficiency and threshold. High conversion efficiency of the scattered light is evidence of laser pulses efficiently exciting gigahertz vibrations in viruses. SLFRS can be used to identify and affect biological nanoparticles. © Published under licence by IOP Publishing Ltd.

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

10.1088/1742-6596/918/1/012041

✓ **نام ژورنال**:

Journal of Physics: Conference Series

✓ **سال انتشار**:

2017

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Raman spectroscopy based screening of IgG positive and negative sera for dengue virus infection

✓ **نویسندگان**:

Bilal M., Saleem M., Bial M., Khan S., Ullah R., Ali H., Ahmed M., Ikram M.

✓ **خلاصه پژوهش**:

A quantitative analysis for the screening of immunoglobulin-G (IgG) positive human sera samples is presented for the dengue virus infection. The regression model was developed using 79 samples while 20 samples were used to test the performance of the model. The R-square (r 2) value of 0.91 was found through a leave-one-sample-out cross validation method, which shows the validity of this model. This model incorporates the molecular changes associated with IgG. Molecular analysis based on regression coefficients revealed that myristic acid, coenzyme-A, alanine, arabinose, arginine, vitamin C, carotene, fumarate, galactosamine, glutamate, lactic acid, stearic acid, tryptophan and vaccenic acid are positively correlated with IgG; while amide III, collagen, proteins, fatty acids, phospholipids and fucose are negatively correlated. For blindly tested samples, an excellent agreement has been found between the model predicted, and the clinical values of IgG. The parameters, which include sensitivity, specificity, accuracy and the area under the receiver operator characteristic curve, are found to be 100%, 83.3%, 95% and 0.99, respectively, which confirms the high quality of the model. © 2017 Astro Ltd.

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

10.1088/1612-202X/aa829e

✓ **نام ژورنال**:

Laser Physics Letters

✓ **سال انتشار**:

2017

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Exploiting the Anti-Aggregation of Gold Nanostars for Rapid Detection of Hand, Foot, and Mouth Disease Causing Enterovirus 71 Using Surface-Enhanced Raman Spectroscopy

✓ نویسندگان:

Reyes M., Piotrowski M., Ang S.K., Chan J., He S., Chu J.J.H., Kah J.C.Y.

✓ خلاصه پژوهش:

Enterovirus 71 (EV71) is a major public health threat that requires rapid point-of-care detection. Here, we developed a surface-enhanced Raman spectroscopy (SERS)-based scheme that utilized protein-induced aggregation of colloidal gold nanostars (AuNS) to rapidly detect EV71 without the need for fabricating a solid substrate, Raman labels or complicated sample handling. We used AuNS (hydrodynamic diameter, DH of 105.12 ± 1.13 nm) conjugated to recombinant scavenger receptor class B, member 2 (SCARB2) protein with known affinity to EV71. In the absence of EV71, AuNS-SCARB2 aggregated in biological media and produced four enhanced Raman peaks at 390, 510, 670, and 910 cm-1. In the presence of EV71, the three peaks at 510, 670, and 910 cm-1 disappeared, while the peak at 390 cm-1 diminished in intensity as the virus bound to AuNS-SCARB2 and prevented them from aggregation. These three peaks (510, 670, and 910 cm-1) were potential markers for specific detection of EV71 as their disappearance was not observable with a different dengue virus (DENV) as our control. Furthermore, the Raman measurements from colloidal SERS were more sensitive in probing the aggregation of AuNS-SCARB2 for detecting the presence of EV71 in protein-rich samples compared to UV-vis spectrum measurements. With this facile "anti-aggregation" approach, we were able to detect EV71 in protein-rich biological medium within 15 min with reasonable sensitivity of 107 pfu/mL and minimal sample preparation, making this translatable for point-of-care applications. © 2017 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/acs.analchem.7b00066

✓ نام ژورنال:

Analytical Chemistry

✓ سال انتشار:

2017

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Towards a correlative approach for characterising single virus particles by transmission electron microscopy and nanoscale Raman spectroscopy

✓ **نویسندگان**:

Hermelink A., Naumann D., Piesker J., Lasch P., Laue M., Hermann P.

✓ **خلاصه پژوهش**:

The morphology and structure of biological nanoparticles, such as viruses, can be efficiently analysed by transmission electron microscopy (TEM). To chemically characterise such nanoparticles in heterogeneous samples at the single particle level, we suggest tip-enhanced Raman spectroscopy (TERS) as a correlative method. Here we describe a TERS-compatible staining procedure for TEM which involves sample pre-scanning by TEM imaging, nanoparticle relocalisation by atomic force microscopy (AFM) followed by spectroscopic characterization of the virus nanoparticles using TERS. First successful correlative measurements are demonstrated on tobacco mosaic virus particles deposited on silicon-based TEM sample supports. In addition, the advantages and problems of this methodology are discussed. © The Royal Society of Chemistry.

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

10.1039/c6an02151d

✓ **نام ژورنال**:

Analyst

✓ **سال انتشار**:

2017

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Raman spectroscopy based investigation of molecular changes associated with an early stage of dengue virus infection

✓ **نویسندگان**:

Bilal M., Bilal M., Saleem M., Khurram M., Khan S., Ullah R., Ali H., Ahmed M., Shahzada S., Khan E.U.

✓ **خلاصه پژوهش**:

Raman spectroscopy based investigations of the molecular changes associated with an early stage of dengue virus infection (DENV) using a partial least squares (PLS) regression model is presented. This study is based on non-structural protein 1 (NS1) which appears after three days of DENV infection. In total, 39 blood sera samples were collected and divided into two groups. The control group contained samples which were the negative for NS1 and antibodies and the positive group contained those samples in which NS1 is positive and antibodies were negative. Out of 39 samples, 29 Raman spectra were used for the model development while the remaining 10 were kept hidden for blind testing of the model. PLS regression yielded a vector of regression coefficients as a function of Raman shift, which were analyzed. Cytokines in the region 775-875 cm-1, lectins at 1003, 1238, 1340, 1449 and 1672 cm-1, DNA in the region 1040-1140 cm-1 and alpha and beta structures of proteins in the region 933-967 cm-1 have been identified in the regression vector for their role in an early stage of DENV infection. Validity of the model was established by its R-square value of 0.891. Sensitivity, specificity and accuracy were 100% each and the area under the receiver operator characteristic curve was found to be 1. © 2017 Astro Ltd Printed in the UK.

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

10.1088/1555-6611/aa5a94

✓ **نام ژورنال**:

Laser Physics

✓ **سال انتشار**:

2017

✓ **کلیدواژه** (Keywords):

✓ **عنوان پژوهش**:

Lactate based optical screening of dengue virus infection in human sera using Raman spectroscopy

✓ **نویسندگان**:

Bilal M., Ullah R., Khan S., Ali H., Saleem M., Ahmed M.

✓ **خلاصه پژوهش**:

This study presents the screening of dengue virus (DENV) infection in human blood sera based on lactate concentration using Raman spectroscopy. A total of 70 samples, 50 from confirmed DENV infected patients and 20 from healthy volunteers have been used in this study. Raman spectra of all these samples have been acquired in the spectral range from 600 cm−1 to 1800 cm−1 using a 532 nm laser as an excitation source. Spectra of all these samples have been analyzed for assessing the biochemical changes resulting from infection. In DENV infected samples three prominent Raman peaks have been found at 750, 830 and 1450 cm−1. These peaks are most probably attributed to an elevated level of lactate due to an impaired function of different body organs in dengue infected patients. This has been proven by an addition of lactic acid solution to the healthy serum in a controlled manner. By the addition of lactic acid solution, the intense Raman bands at 1003, 1156 and 1516 cm−1 found in the spectrum of healthy serum got suppressed when the new peaks appeared around 750, 830, 925, 950, 1123, 1333, 1450, 1580 and 1730 cm−1. The current study predicts that lactate may possibly be a potential biomarker for the diagnosis of DENV infection. © 2017 Optical Society of America.

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

10.1364/BOE.8.001250

✓ **نام ژورنال**:

Biomedical Optics Express

✓ **سال انتشار**:

2017

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Early Diagnosis of Influenza Virus A Using Surface-enhanced Raman Scattering-based Lateral Flow Assay

✓ **نویسندگان**:

Park H.J., Yang S.C., Choo J.

✓ **خلاصه پژوهش**:

We report a surface-enhanced Raman scattering (SERS)-based lateral flow assay (LFA) kit for the rapid diagnosis of influenza virus A. Influenza virus A is highly infectious and causes acute respiratory diseases. Therefore, it is important to diagnose the virus early to prevent a pandemic and to provide appropriate treatment to the patient and vaccination of high-risk individuals. Conventional diagnostic tests, including virus cell culture and real-time polymerase chain reaction, take longer than 1 day to confirm the disease. In contrast, a commercially available rapid influenza diagnostic test can detect the infection within 30 min, but it is hard to confirm viral infection using only this test because of its low sensitivity. Therefore, the development of a rapid and simple test for the early diagnosis of influenza infection is urgently needed. To resolve these problems, we developed a SERS-based LFA kit in which the gold nanoparticles in the commercial rapid kit were replaced with SERS-active nano tags. It is possible to quantitatively detect the influenza virus A with high sensitivity by measuring the enhanced Raman signal of these SERS nano tags on the LFA strip. The limit of detection (LOD) using our proposed SERS-based LFA kit was estimated to be 1.9 × 104 PFU/mL, which is approximately one order of magnitude more sensitive than the LOD determined from the colorimetric LFA kit. © 2016 Korean Chemical Society, Seoul & Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim

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

10.1002/bkcs.11021

✓ **نام ژورنال**:

Bulletin of the Korean Chemical Society

✓ **سال انتشار**:

2016

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Raman spectroscopy-based screening of IgM positive and negative sera for dengue virus infection

✓ **نویسندگان**:

Bilal M., Saleem M., Bilal M., Ijaz T., Khan S., Ullah R., Raza A., Khurram M., Akram W., Ahmed M.

✓ **خلاصه پژوهش**:

A statistical method based on Raman spectroscopy for the screening of immunoglobulin M (IgM) in dengue virus (DENV) infected human sera is presented. In total, 108 sera samples were collected and their antibody indexes (AI) for IgM were determined through enzyme-linked immunosorbent assay (ELISA). Raman spectra of these samples were acquired using a 785 nm wavelength excitation laser. Seventy-eight Raman spectra were selected randomly and unbiasedly for the development of a statistical model using partial least square (PLS) regression, while the remaining 30 were used for testing the developed model. An R-square (r 2) value of 0.929 was determined using the leave-one-sample-out (LOO) cross validation method, showing the validity of this model. It considers all molecular changes related to IgM concentration, and describes their role in infection. A graphical user interface (GUI) platform has been developed to run a developed multivariate model for the prediction of AI of IgM for blindly tested samples, and an excellent agreement has been found between model predicted and clinically determined values. Parameters like sensitivity, specificity, accuracy, and area under receiver operator characteristic (ROC) curve for these tested samples are also reported to visualize model performance. © 2016 Astro Ltd.

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

10.1088/1054-660X/26/11/115602

✓ **نام ژورنال**:

Laser Physics

✓ **سال انتشار**:

2016

✓ **کلیدواژه** (Keywords):

✓ عنوان پژوهش:

Research on the medicinal effective component and characterization of virus-free breeding and sulfur smoked Qi chrysanthemum based on FTIR and FT-Raman

✓ نویسندگان:

Wang Y.-T., Cao L.-F., Yang Z., Yan B., Zhang L.-J.

✓ خلاصه پژوهش:

Based on Fourier transform infrared (FTIR) and Raman spectroscopy (FT - Raman), the effective medicinal composition and its content change of Qi chrysanthemum are directly and quickly determined among the virus-free breeding and sulfur smoked samples of three different groups. FTIR and FT-Raman spectra of three groups of Qi chrysanthemum sample are compared and analyzed. The results show that the intensities of multiple infrared absorption peaks are obvious different within the range of 1 800~500 cm-1 and the characteristic peak shapes are slightly different in the FTIR spectra of the three groups with obvious differences of characteristic peak shapes in FT - Raman spectrum have. FTIR and FT - Raman spectrum directly reflect that the stem tip virus-free breeding will make the volatile oil, flavonoids and other medicinal component content increase in Qi Chrysanthemum, but the sulfur smoked reduce. The FTIR, FT Raman spectroscopy for detection of effective medicinal composition changes in Qi Chrysanthemum caused by virus-free breeding or sulfur smoked establishes a scientific basis, also an effective method to test their component content. © 2016, Peking University Press. All right reserved.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.3964/j.issn.1000-0593(2016)09-2780-04

✓ نام ژورنال:

Guang Pu Xue Yu Guang Pu Fen Xi/Spectroscopy and Spectral Analysis

✓ سال انتشار:

2016

✓ کلیدواژه (Keywords):

Detect Precisely

✓ **عنوان پژوهش**:

Raman spectroscopy based discrimination of NS1 positive and negative dengue virus infected serum

✓ **نویسندگان**:

Bilal M., Saleem M., Bilal M., Khurram M., Khan S., Ullah R., Ali H., Ahmed M.

✓ **خلاصه پژوهش**:

This study is intended to develop a multivariate statistical model for the prediction of nonstructural protein 1 (NS1) in dengue virus (DENV) infected blood serum in humans. The model has been developed on the basis of partial least squares regression using the Raman spectra of NS1 positive and NS1 negative samples. Human blood sera of 218 subjects is included in this study, of which 95 were NS1 positive and 123 were NS1 negative, which was confirmed with the enzyme linked immunosorbent assay method. For model development, 80 NS1 positive and 98 NS1 negative samples were used, while 40 DENV suspected samples were used for double blind testing of the model. This selection of samples was performed by the code in an automatic manner to avoid biasing. A laser at 785 nm was used as the excitation source to acquire Raman spectra of samples with an integration time of 15 s. The multivariate model yields coefficients of regression at corresponding Raman shifts. These coefficients represent changes in the molecular structures associated with NS1 positive and negative samples. The analysis of the regression coefficients which differentiate NS1 positive and NS1 negative groups shows an increasing trend for phosphatidylinositol, ceramide, and amide-III, and a decreasing trend for thiocyanate in the DENV infected serum. The R-squared value of the model was found to be 0.91, which is clinically acceptable. The blind testing of 40 suspected samples yields an accuracy, sensitivity, and specificity of about 100% each. © 2016 Astro Ltd.

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

10.1088/1612-2011/13/9/095603

✓ **نام ژورنال**:

Laser Physics Letters

✓ **سال انتشار**:

2016

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Stimulated low-frequency Raman scattering in viruses

✓ **نویسندگان**:

Karpova O.V., Kudryavtseva A.D., Lednev V.N., Oshurko V.B., Pershin S.M., Petrova E.K., Tcherniega N.V., Zemskov K.I.

✓ **خلاصه پژوهش**:

Stimulated low-frequency Raman scattering (SLFRS), caused by laser pulses interaction with the radial breathing modes of tobacco mosaic virus (TMV) in Tris-HCl pH7.5 buffer was registered. SLFRS frequency shift, conversion efficiency and threshold are measured. © 2016 IEEE.

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

10.1109/LO.2016.7549868

✓ **نام ژورنال**:

Proceedings - 2016 International Conference Laser Optics, LO 2016

✓ **سال انتشار**:

2016

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Stimulated low-frequency Raman scattering in a suspension of tobacco mosaic virus

✓ **نویسندگان**:

Karpova O.V., Kudryavtseva A.D., Lednev V.N., Mironova T.V., Oshurko V.B., Pershin S.M., Petrova E.K., Tcherniega N.V., Zemskov K.I.

✓ **خلاصه پژوهش**:

The interaction of laser pulses with tobacco mosaic virus (TMV) in Tris-HCl pH7.5 buffer and in water has been investigated. Ruby laser pulses of 20 ns duration have been used for excitation. The spectrum of the light passing through the sample was registered with the help of a Fabry-Perot interferometer. In the case of TMV in water we observed in the spectrum only one line of the exciting laser light, but for TMV in Tris-HCl pH7.5 buffer a second line appeared, corresponding to stimulated low-frequency Raman scattering (SLFRS) on the breathing radial mode of TMV. The frequency shift of the SLFRS by 2 cm-1 (60 GHz), the conversion efficiency and the threshold are measured for the first time to the best of our knowledge. © 2016 Astro Ltd.

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

10.1088/1612-2011/13/8/085701

✓ **نام ژورنال**:

Laser Physics Letters

✓ **سال انتشار**:

2016

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Erratum to "A virus-based nanoplasmonic structure as a surface-enhanced Raman biosensor" [Biosens. Bioelectron. 77 (2016) 306-314].doi: 10.1016/j.bios.2015.09.032.

✓ **نویسندگان**:

Lebedev N., Griva I., Dressick W.J., Phelps J., Johnson J.E., Meshcheriakova Y., Lomonossoff G.P., Soto C.M.

✓ **خلاصه پژوهش**:

[No abstract available]

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

10.1016/j.bios.2015.12.048

✓ **نام ژورنال**:

Biosensors and Bioelectronics

✓ **سال انتشار**:

2016

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Handheld Raman spectroscopy for the early detection of plant diseases:: Abutilon mosaic virus infecting Abutilon sp.

✓ **نویسندگان**:

Yeturu S., Vargas Jentzsch P., CiobotĂ V., Guerrero R., Garrido P., Ramos L.A.

✓ **خلاصه پژوهش**:

Plant diseases have a direct impact on the productivity of crops, and therefore the early detection of diseases is crucial. Abutilon mosaic virus (AbMV) (family Geminiviridae; genus Begomovirus) is an important virus infecting ornamental crops throughout the world. Abutilon hybridum showing bright yellow mosaic symptoms were observed in gardens in Tumbaco, Ecuador. The infection was confirmed by Polymerase Chain Reaction (PCR) using degenerate begomovirus primers. The amplicon (~500 bp) was sequenced, submitted to NCBI (KP877621) and showed 68.7-100% and 72.7-100% sequence identity with other begomoviruses at nucleotide and amino acid levels, respectively. In order to evaluate Raman spectroscopy as a diagnostic tool for AbMV infection, spectra of leaves from healthy and infected plants were recorded. Raman signals of carotenoids are the most important features and there is a significant decrease in the intensity of these bands when the plant is infected. The difference in the intensity of the bands, particularly the one at 1526 cm-1, is proposed as a basis for the early detection of viral infection in plants. © 2016 The Royal Society of Chemistry.

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

10.1039/c6ay00381h

✓ **نام ژورنال**:

Analytical Methods

✓ **سال انتشار**:

2016

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Effects of temperature and pH on the growth of H1N1 subtype of influenza A virus by surface-enhanced Raman spectroscopy

✓ **نویسندگان**:

Jia X., Li Y., Fan W., Sun Q., Zhou T., Liu W., Li J.

✓ **خلاصه پژوهش**:

Surface enhanced Raman spectroscopy technology (SERS), using gold nanoparticles as a base, was developed for rapid and sensitive detection of virus strains. SERS can be used as a rapid and reliable method to distinguish the titers of viral replication. In the present study, we characterized H1N1 subtypes of influenza A virus strains in different conditions of pH or temperatures, while we analyzed data from SERS technology using gold nanoparticles as a base and cell cultures were employed to further confirm the data from virus strains. Origin8.0 was used to collect Raman spectra, smooth and homogenize data, and to contrast spectra. Our results indicated that the peaks of different virus strains in optimal environmental conditions (T=37°C/pH=7.2) reached ≥3000. This criterion was verified by subsequent virological method. The present data indicate that the established SERS protocol can be used as a rapid and reliable method to distinguish the replication rate of virus, which can be further used in clinical samples. © 2016 Chin J Biotech, All right reserved.

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

10.13345/j.cjb.150362

✓ **نام ژورنال**:

Shengwu Gongcheng Xuebao/Chinese Journal of Biotechnology

✓ **سال انتشار**:

2016

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Detection of vero cells infected with herpes simplex types 1 and 2 and varicella zoster viruses using raman spectroscopy and advanced statistical methods

✓ **نویسندگان**:

Huleihel M., Shufan E., Zeiri L., Salman A.

✓ **خلاصه پژوهش**:

Of the eight members of the herpes family of viruses, HSV1, HSV2, and varicella zoster are the most common and are mainly involved in cutaneous disorders. These viruses usually are not life-threatening, but in some cases they might cause serious infections to the eyes and the brain that can lead to blindness and possibly death. An effective drug (acyclovir and its derivatives) is available against these viruses. Therefore, early detection and identification of these viral infections is highly important for an effective treatment. Raman spectroscopy, which has been widely used in the past years in medicine and biology, was used as a powerful spectroscopic tool for the detection and identification of these viral infections in cell culture, due to its sensitivity, rapidity and reliability. Our results showed that it was possible to differentiate, with a 97% identification success rate, the uninfected Vero cells that served as a control, from the Vero cells that were infected with HSV-1, HSV-2, and VZV. For that, linear discriminant analysis (LDA) was performed on the Raman spectra after principal component analysis (PCA) with a leave one out (LOO) approach. Raman spectroscopy in tandem with PCA and LDA enable to differentiate among the different herpes viral infections of Vero cells in time span of few minutes with high accuracy rate. Understanding cell molecular changes due to herpes viral infections using Raman spectroscopy may help in early detection and effective treatment. © 2016 Huleihel et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

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

10.1371/journal.pone.0153599

✓ **نام ژورنال**:

PLoS ONE

✓ **سال انتشار**:

2016

✓ **کلیدواژه** (Keywords):

✓ **عنوان پژوهش**:

A virus-based nanoplasmonic structure as a surface-enhanced Raman biosensor

✓ **نویسندگان**:

Lebedev N., Griva I., Dressick W.J., Phelps J., Johnson J.E., Meshcheriakova Y., Lomonossoff G.P., Soto C.M.

✓ **خلاصه پژوهش**:

Fabrication of nanoscale structures with localized surface plasmons allows for substantial increase in sensitivity of chem/bio sensors. The main challenge for realizing complex nanoplasmonic structures in solution is the high level of precision required at the nanoscale to position metal nanoparticles in 3D. In this study, we report a virus-like particle (VLP) for building a 3D plasmonic nanostructure in solution in which gold nanoparticles are precisely positioned on the VLP by directed self-assembly techniques. These structures allow for concentration of electromagnetic fields in the desired locations between the gold nanoparticles or "hot spots". We measure the efficiency of the optical field spatial concentration for the first time, which results in a ten-fold enhancement of the capsid Raman peaks. Our experimental results agree with our 3D finite element simulations. Furthermore, we demonstrate as a proof-of-principle that the plasmonic nanostructures can be utilized in DNA detection down to 0.25 ng/μl (lowest concentration tested), while the protein peaks from the interior of the nanoplasmonic structures, potentially, can serve as an internal tracer for the biosensors. © 2015.

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

10.1016/j.bios.2015.09.032

✓ **نام ژورنال**:

Biosensors and Bioelectronics

✓ **سال انتشار**:

2016

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Raman spectroscopic analysis of dengue virus infection in human blood sera

✓ **نویسندگان**:

Khan S., Ullah R., Saleem M., Bilal M., Rashid R., Khan I., Mahmood A., Nawaz M.

✓ **خلاصه پژوهش**:

We are presenting Raman spectroscopic analysis of dengue virus infection in the human blood sera. Blood samples from 40 individuals infected with dengue virus and 25 healthy volunteers have been used in this study. Raman spectra of all these samples have been acquired in the spectral range from 600 cm-1 to 1750 cm-1 using 532 nm laser as an excitation source. These Raman spectra have been used to analyze the biochemical changes appeared in the blood caused by dengue virus infection. Two Raman lines at 750 cm-1 and 850 cm-1 found in all spectra of dengue infected sera, indicate the presence of adenosine diphosphate (ADP), which is expected to be excreted due to rupturing of thrombocytes. © 2015 Elsevier GmbH.

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

10.1016/j.ijleo.2015.11.060

✓ **نام ژورنال**:

Optik

✓ **سال انتشار**:

2016

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

A sensitive surface-enhanced Raman scattering enzyme-catalyzed immunoassay of respiratory syncytial virus

✓ **نویسندگان**:

Zhan L., Zhen S.J., Wan X.Y., Gao P.F., Huang C.Z.

✓ **خلاصه پژوهش**:

Respiratory viruses have become a major global health challenge which would benefit from advances in screening methods for early diagnosis. Respiratory syncytial virus (RSV) is one of the most important pathogen causing severe lower respiratory tract infections. Here we present a novel surface-enhanced Raman scattering (SERS) enzyme-catalyzed immunoassay of RSV by employing peroxidase substrate 3, 3′-5, 5′-tetramethylbenzidine (TMB) as Raman molecule. Horseradish peroxidase (HRP) attached to the detection antibody in a novel sandwich immunoassay catalyzes the oxidation of TMB by H2O2 to give a radical cation (TMB+), which could be easily adsorbed on the negatively charged surface of silver nanoparticles (AgNPs) through electrostatic interaction, inducing the aggregation of AgNPs and thus giving a strong SERS signal. A linear relationship was obtained between the Raman intensity and the amount of RSV in the range from 0.5 to 20 pg/mL, and the minimum detectable concentration of this SERS-based enzyme immunoassay was 0.05 pg/mL, which was 20 times lower than that found in the colorimetric method. © 2015 Elsevier B.V. All rights reserved.

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

10.1016/j.talanta.2015.10.081

✓ **نام ژورنال**:

Talanta

✓ **سال انتشار**:

2016

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Extrinsic surface-enhanced Raman scattering detection of influenza A virus enhanced by two-dimensional gold@silver core-shell nanoparticle arrays

✓ نویسندگان:

Karn-Orachai K., Sakamoto K., Laocharoensuk R., Bamrungsap S., Songsivilai S., Dharakul T., Miki K.

✓ خلاصه پژوهش:

A surface-enhanced Raman scattering (SERS) based biosensor using a direct immunoassay platform is demonstrated for influenza A detection. The nucleoprotein of influenza A virus, which is one of the most conserved and abundant structural proteins on the virion, was used as a target. In this study, highly sensitive biosensors were realized by combining specific recognition of antibody-antigen interactions and high signal enhancement of the SERS effect. SERS probes were fabricated by decorating PEGylated, 4,4′-thiobisbenzenethiol (TBBT)-labeled gold nanoparticles (NPs) with influenza A antibodies. To improve the sensitivity, a SERS immunoassay was performed on two-dimensional (2D) arrays of gold@silver core-shell (Au@Ag) NPs, which work as SERS substrates. The SERS signal of TBBT was utilized to detect the selective nucleoprotein-antibody recognition. The SERS signal was enhanced ~4 times by using the SERS substrates instead of a flat Au film. These results indicate that using a well-tuned Au@Ag 2D array as a SERS substrate is an effective way of improving sensitivity of SERS-based biosensors. Our SERS immunoassay system revealed high selectivity and good reproducibility with a sample-to-sample variation of 4.6% (relative standard deviation). To demonstrate the applicability of our SERS immunoassay system to real biological samples, the detection of influenza A using infected allantoic fluid was also performed. The linear relation between the concentration of infected allantoic fluid and the SERS signal was obtained in the range of 5 to 56 TCID50 per mL (R2 = 0.96 for the TBBT Raman bands at 1565 cm-1) with the lowest detection limit of 6 TCID50 per mL. These findings demonstrated the potential of this SERS immunosensor platform for the highly sensitive and specific detection of target molecules in a complex matrix commonly found in clinical specimens. © 2016 Royal Society of Chemistry.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1039/c6ra17143e

✓ نام ژورنال:

RSC Advances

✓ سال انتشار:

2016

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Classification of cucumber green mottle mosaic virus (CGMMV) infected watermelon seeds using Raman spectroscopy

✓ **نویسندگان**:

Lee H., Lim H.-S., Cho B.-K.

✓ **خلاصه پژوهش**:

The Cucumber Green Mottle Mosaic Virus (CGMMV) is a globally distributed plant virus. CGMMV-infected plants exhibit severe mosaic symptoms, discoloration, and deformation. Therefore, rapid and early detection of CGMMV infected seeds is very important for preventing disease damage and yield losses. Raman spectroscopy was investigated in this study as a potential tool for rapid, accurate, and nondestructive detection of infected seeds. Raman spectra of healthy and infected seeds were acquired in the 400 cm-1 to 1800 cm-1 wavenumber range and an algorithm based on partial least-squares discriminant analysis was developed to classify infected and healthy seeds. The classification model's accuracies for calibration and prediction data sets were 100% and 86%, respectively. Results showed that the Raman spectroscopic technique has good potential for nondestructive detection of virus-infected seeds. © 2016 SPIE.

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

10.1117/12.2228264

✓ **نام ژورنال**:

Proceedings of SPIE - The International Society for Optical Engineering

✓ **سال انتشار**:

2016

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Rapid and sensitive determination of HIV-1 virus based on surface enhanced raman spectroscopy

✓ **نویسندگان**:

Lee J.-H., Kim B.-C., Oh B.-K., Choi J.-W.

✓ **خلاصه پژوهش**:

In this study, rapid and sensitive detection of human immunodeficiency virus (HIV)-1 was performed based on immunoreactions with an Au nanodot fabricated indium tin oxide (ITO) substrate using surface-enhanced Raman spectroscopy (SERS). Highly ordered Au nanodots (ca. 20 nm) were electrochemically fabricated over a large surface area (20 mm× 10 mm) of an ITO substrate using a simple deposition method with Triton X-100. On the Au nanodot surface, monoclonal antibody fragments against gp120 were selectively bound by gold-sulfur interactions. Various concentrations (35 fg/mL to 350 pg/mL) of HIV-1 virus-like particles (HIV-1 VLPs) were used for the measurements. The presence of HIV-1 VLPs was rapidly (within 5 s) and successfully determined by SERS due to specific immunoreactions on the Au nanodots without the use of labeling probes. The results showed the possibility of using SERS-related methods as a new immunoassay for the study of biomolecular interactions and detection of low viral loads. Moreover, based on its high sensitivity and chemical specificity, SERS could be used as a promising clinical tool for detecting infectious small biological components. Copyright © 2015 American Scientific Publishers. All rights reserved.

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

10.1166/jbn.2015.2117

✓ **نام ژورنال**:

Journal of Biomedical Nanotechnology

✓ **سال انتشار**:

2015

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Identification of Newly Emerging Influenza Viruses by Surface-Enhanced Raman Spectroscopy

✓ **نویسندگان**:

Lim J.-Y., Nam J.-S., Yang S.-E., Shin H., Jang Y.-H., Bae G.-U., Kang T., Lim K.-I., Choi Y.

✓ **خلاصه پژوهش**:

In this work, we demonstrate in situ virus identification based on surface-enhanced Raman scattering (SERS). We hypothesized that newly emerging influenza viruses possess surface proteins and lipids that can generate distinctive Raman signals. To test this hypothesis, SERS signals were measured from the surface of a noninfluenza virus, two different influenza viruses, and a genetically shuffled influenza virus. To ensure the safety for experimenters we constructed nonreplicating pseudotyped viruses that display main influenza virus surface components. Pseudotype with influenza virus components produced enhanced Raman peaks, on gold nanoparticles, that are easily distinguishable from those of pseudotype with a noninfluenza virus component, vesicular stomatitis virus G protein (VSVG). Furthermore, virus with the surface components of a newly emerging influenza strain, A/California/04/2009 (H1N1), generated Raman peaks different from those of viruses with components of the conventional laboratory-adapted influenza strain, A/WSN/33 (H1N1). Interestingly, the virus simultaneously displaying surface components of both influenza strains, a model mutant with genome reassortment, also produced a Raman signal pattern that is clearly distinguishable from those of each strain. This work highlights that SERS can provide a powerful label-free strategy to quickly identify newly emerging and potentially fatal influenza viruses. © 2015 American Chemical Society.

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

10.1021/acs.analchem.5b02661

✓ **نام ژورنال**:

Analytical Chemistry

✓ **سال انتشار**:

2015

✓ **کلیدواژه** (Keywords):

✓ **عنوان پژوهش**:

Bioconjugated Gold Nanoparticle Based SERS Probe for Ultrasensitive Identification of Mosquito-Borne Viruses Using Raman Fingerprinting

✓ **نویسندگان**:

Paul A.M., Fan Z., Sinha S.S., Shi Y., Le L., Bai F., Ray P.C.

✓ **خلاصه پژوهش**:

Dengue virus (DENV) and West Nile virus (WNV) are two well-documented mosquito-borne flaviviruses that cause significant health problems worldwide. Driven by this need, we have developed a bioconjugated gold nanoparticle (AuNP) based surface enhanced Raman spectroscopy (SERS) probe for the detection of both DENV and WNV. Reported data demonstrate that the antiflavivirus 4G2 antibody conjugated gold nanoparticle (GNP) SERS probe can be used as a Raman fingerprint for the ultrasensitive detection of DENV and WNV selectively. Experimental data show that, due to the plasmon coupling in nanoassembly, antibody conjugated GNP based SERS is able to detect as low as 10 plaque-forming units (PFU)/mL of DENV-2 and WNV, which is comparable with the sensitivity of quantitative PCR based assays. Selectivity of our probe was validated using another mosquito-borne chikungunya virus (CHIKV) as a negative control. Experimental data demonstrate that the huge enhancement of SERS intensity is mainly due to strong electric field enhancement, which has been confirmed by a finite-difference time-domain (FDTD) simulation. Reported FDTD simulation data indicate the SERS enhancement factor can be more than 104 times, due to the assembled structure. Reported results suggest that bioconjugated AuNP-4G2 based SERS probes have great potential to be used to screen viral particles in clinical and research based laboratories. © 2015 American Chemical Society.

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

10.1021/acs.jpcc.5b07387

✓ **نام ژورنال**:

Journal of Physical Chemistry C

✓ **سال انتشار**:

2015

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Correlation between METAVIR scores and Raman spectroscopy in liver lesions induced by hepatitis C virus: a preliminary study

✓ **نویسندگان**:

Gaggini M.C.R., Navarro R.S., Stefanini A.R., Sano R.S., Silveira L., Jr.

✓ **خلاصه پژوهش**:

The viral hepatitis C is one of the most important causes of chronic hepatic illness worldwide, affecting around 3 % of the world population. Raman spectroscopy has been employed to distinguish normal from hepatic lesions through differences in the spectral features related to the METAVIR score system. This preliminary study evaluated 11 patients with diagnoses of chronic hepatitis C who underwent hepatic biopsies; the biopsies were submitted to near-infrared Raman spectroscopy using a dispersive spectrometer (830-nm wavelength, 300-mW laser power, and 20-s exposure time). The METAVIR was further scored, and the spectra were submitted to principal component analysis (PCA). The results show a good correlation between the Raman spectroscopy features and the stage of hepatic inflammation and fibrosis. PCA showed that samples with a higher degree of fibrosis presented a higher amount of protein features (collagen), whereas samples with a higher degree of inflammation presented higher features of hemoglobin, in accordance to the expected evolution of chronic hepatitis. Quinone was found to be an important biomarker in early hepatic lesions with a spectral feature at 1595 cm−1. This study demonstrates that Raman spectroscopy may become an important tool for diagnosing liver disease. © 2015, Springer-Verlag London.

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

10.1007/s10103-015-1741-6

✓ **نام ژورنال**:

Lasers in Medical Science

✓ **سال انتشار**:

2015

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Comparison of a compatible and an incompatible pepper-tobamovirus interaction by biochemical and non-invasive techniques: Chlorophyll a fluorescence, isothermal calorimetry and FT-Raman spectroscopy

✓ نویسندگان:

Rys M., Juhász C., Surówka E., Janeczko A., Saja D., Tóbiás I., Skoczowski A., Barna B., Gullner G.

✓ خلاصه پژوهش:

Leaves of a pepper cultivar harboring the L3 resistance gene were inoculated with Obuda pepper virus (ObPV), which led to the appearance of hypersensitive necrotic lesions approx. 72 h post-inoculation (hpi) (incompatible interaction), or with Pepper mild mottle virus (PMMoV) that caused no visible symptoms on the inoculated leaves (compatible interaction). ObPV inoculation of leaves resulted in ion leakage already 18 hpi, up-regulation of a pepper carotenoid cleavage dioxygenase (CCD) gene from 24 hpi, heat emission and declining chlorophyll a content from 48 hpi, and partial desiccation from 72 hpi. After the appearance of necrotic lesions a strong inhibition of photochemical energy conversion was observed, which led to photochemically inactive leaf areas 96 hpi. However, leaf tissues adjacent to these inactive areas showed elevated ΦPSII and Fv/Fm values proving the advantage of chlorophyll a imaging technique. PMMoV inoculation also led to a significant rise of ion leakage and heat emission, to the up-regulation of the pepper CCD gene as well as to decreased PSII efficiency, but these responses were much weaker than in the case of ObPV inoculation. Chlorophyll b and total carotenoid contents as measured by spectrophotometric methods were not significantly influenced by any virus inoculations when these pigment contents were calculated on leaf surface basis. On the other hand, near-infrared FT-Raman spectroscopy showed an increase of carotenoid content in ObPV-inoculated leaves suggesting that the two techniques detect different sets of compounds. © 2014 Elsevier Masson SAS.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/j.plaphy.2014.08.013

✓ نام ژورنال:

Plant Physiology and Biochemistry

✓ سال انتشار:

2014

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Characterization and detection of Vero cells infected with Herpes Simplex Virus type 1 using Raman spectroscopy and advanced statistical methods

✓ **نویسندگان**:

Salman A., Shufan E., Zeiri L., Huleihel M.

✓ **خلاصه پژوهش**:

Herpes viruses are involved in a variety of human disorders. Herpes Simplex Virus type 1 (HSV-1) is the most common among the herpes viruses and is primarily involved in human cutaneous disorders. Although the symptoms of infection by this virus are usually minimal, in some cases HSV-1 might cause serious infections in the eyes and the brain leading to blindness and even death. A drug, acyclovir, is available to counter this virus. The drug is most effective when used during the early stages of the infection, which makes early detection and identification of these viral infections highly important for successful treatment. In the present study we evaluated the potential of Raman spectroscopy as a sensitive, rapid, and reliable method for the detection and identification of HSV-1 viral infections in cell cultures. Using Raman spectroscopy followed by advanced statistical methods enabled us, with sensitivity approaching 100%, to differentiate between a control group of Vero cells and another group of Vero cells that had been infected with HSV-1. Cell sites that were "rich in membrane" gave the best results in the differentiation between the two categories. The major changes were observed in the 1195-1726cm-1 range of the Raman spectrum. The features in this range are attributed mainly to proteins, lipids, and nucleic acids. © 2014.

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

10.1016/j.ymeth.2014.02.022

✓ **نام ژورنال**:

Methods

✓ **سال انتشار**:

2014

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Human papilloma virus genotyping by surface-enhanced Raman scattering

✓ **نویسندگان**:

Hibbitts S., White P.L., Green J., McNay G., Graham D., Stevenson R.

✓ **خلاصه پژوهش**:

The first Human Papilloma Virus (HPV) genotyping assay using surface-enhanced Raman scattering (SERS) is reported. Validated PCR primers were used to generate amplification products from plasmids, a control cell line and clinical specimens enabling subsequent identification of specific HPV genotypes using type specific probes across six channels. © 2014 The Royal Society of Chemistry.

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

10.1039/c4ay00155a

✓ **نام ژورنال**:

Analytical Methods

✓ **سال انتشار**:

2014

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Raman spectroscopic signatures of echovirus 1 uncoating

✓ **نویسندگان**:

Ruokola P., Dadu E., Kazmertsuk A., Häkkänen H., Marjomäki V., Ihalainen J.A.

✓ **خلاصه پژوهش**:

In recent decades, Raman spectroscopy has entered the biological and medical fields. It enables nondestructive analysis of structural details at the molecular level and has been used to study viruses and their constituents. Here, we used Raman spectroscopy to study echovirus 1 (EV1), a small, nonenveloped human pathogen, in two different uncoating states induced by heat treatments. Raman signals of capsid proteins and RNA genome were observed from the intact virus, the uncoating intermediate, and disrupted virions. Transmission electron microscopy data revealed general structural changes between the studied particles. Compared to spectral characteristics of proteins in the intact virion, those of the proteins of the heat-treated particles indicated reduced α-helix content with respect to β-sheets and coil structures. Changes observed in tryptophan and tyrosine signals suggest an increasingly hydrophilic environment around these residues. RNA signals revealed a change in the environment of the genome and in its conformation. The ionized-carbonyl vibrations showed small changes between the intact virion and the uncoating intermediate, which points to cleavage of salt bridges in the protein structure during the uncoating process. In conclusion, our data reveal distinguishable Raman signatures of the intact, intermediate, and disrupted EV1 particles. These changes indicate structural, chemical, and solute-solvent alterations in the genome and in the capsid proteins and lay the essential groundwork for investigating the uncoating of EV1 and related viruses in real time. © 2014, American Society for Microbiology.

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

10.1128/JVI.03398-13

✓ **نام ژورنال**:

Journal of Virology

✓ **سال انتشار**:

2014

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Noninvasive and label-free determination of virus infected cells by Raman spectroscopy

✓ **نویسندگان**:

Moor K., Ohtani K., Myrzakozha D., Zhanserkenova O., Andriana B.B., Sato H.

✓ **خلاصه پژوهش**:

The present study demonstrates that Raman spectroscopy is a powerful tool for the detection of virusinfected cells. Adenovirus infection of human embryonic kidney 293 cells was successfully detected at 12, 24, and 48 h after initiating the infection. The score plot of principal component analysis discriminated the spectra of the infected cells from those of the control cells. The viral infection was confirmed by the conventional immunostaining method performed 24 h after the infection. The newly developed method provides a fast and label-free means for the detection of virus-infected cells. © The Authors. Published by SPIE under a Creative Commons Attribution 3.0 Unported License.

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

10.1117/1.JBO.19.6.067003

✓ **نام ژورنال**:

Journal of Biomedical Optics

✓ **سال انتشار**:

2014

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Analysis of virus infected cell by Raman spectroscopy and transmission electron microscopy

✓ **نویسندگان**:

Moor K., Ohtani K., Myrzakozha D., Zhanserkenova O., Andriana B.B., Sato H.

✓ **خلاصه پژوهش**:

Raman spectroscopy is a promising tool for detection of virus infection in live cells. In the present study, we demonstrate its feasibility to observe dynamic reaction of the live cell infected by virus. The Raman spectra of the adenovirus infected live cell (293 HEK) are analyzed by comparing with those of control cells. Principal component analysis (PCA) is employed also to analyze the spectra in detail. A band at 1650 cm-1 increases its intensity in the spectra measured at 24 hours after the virus infection. The infection of the virus is also examined by immune-staining and transmission electron microscope (TEM), and the virus infection is confirmed with these method also. It should be noted that the present technique does not require specifying the type of virus in advance. © 2014 SPIE.

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

10.1117/12.2038020

✓ **نام ژورنال**:

Progress in Biomedical Optics and Imaging - Proceedings of SPIE

✓ **سال انتشار**:

2014

✓ **کلیدواژه** (Keywords):

Detect Precisely

✓ **عنوان پژوهش**:

Feasibility study for detection of Turnip yellow mosaic virus (TYMV) infection of Chinese cabbage plants using Raman spectroscopy

✓ **نویسندگان**:

Kim S., Lee S., Chi H.-Y., Kim M.-K., Kim J.-S., Lee S.-H., Chung H.

✓ **خلاصه پژوهش**:

Raman spectroscopy provides many advantages compared to other common analytical techniques due to its ability of rapid and accurate identification of unknown specimens as well as simple sample preparation. Here, we described potential of Raman spectroscopic technique as an efficient and high throughput method to detect plants infected by economically important viruses. To enhance the detection sensitivity of Raman measurement, surface enhanced Raman scattering (SERS) was employed. Spectra of extracts from healthy and Turnip yellow mosaic virus (TYMV) infected Chinese cabbage leaves were collected by mixing with gold (Au) nanoparticles. Our result showed that TYMV infected plants could be discriminated from non-infected healthy plants, suggesting the current method described here would be an alternative potential tool to screen virus-infection of plants in fields although it needs more studies to generalize the technique. © The Korean Society of Plant Pathology.

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

10.5423/PPJ.NT.09.2012.0147

✓ **نام ژورنال**:

Plant Pathology Journal

✓ **سال انتشار**:

2013

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Could near-infrared Raman spectroscopy be correlated with the METAVIR scores in liver lesions induced by hepatitis C virus?

✓ نویسندگان:

Gaggini M.C.R., Navarro R.S., Stefanini A.R., Sano R.S., Silveira Jr. L.

✓ خلاصه پژوهش:

The liver is responsible for several basic functions in human body how the syntheses of the most main proteins and degradation process of toxins, drugs and alcohols. In present days, the viral hepatitis C is one of the highest causes of chronic hepatic illness worldwide, affecting around 3% of the world population. The liver biopsy is considered the gold standard for diagnosing hepatic fibrosis; however, the biopsies may be questioned because of potential sampling error, morbidity, possible mortality and relatively high costs. Spectroscopy techniques such as Raman spectroscopy have been used for diagnosis of human tissues, with favorable results. Raman spectroscopy has been employed to distinguish normal from hepatic lesions through spectral features mainly of proteins, nucleic acids and lipids. In this study, eleven patients with diagnoses of chronic hepatitis C underwent hepatic biopsies having two hepatic fragments collected: one was scored through METAVIR system and the other one was submitted to near-infrared Raman spectroscopy using a dispersive spectrometer (830 nm wavelength, 300 mW laser power and 20 s exposure time). Five spectra were collected in each fragment and submitted to Principal Components Analysis (PCA). Results showed a good correlation between the Raman spectroscopy features and the stage of hepatic fibrosis and inflammation. PCA showed that samples with higher degree of fibrosis presented higher amount of protein features (collagen), whereas samples of higher degree of inflammation presented higher features of hemoglobin, in accordance to the expected evolution of the chronic hepatitis. It has been found an important biomarker for the beginning of hepatic lesion (quinone) with a spectral feature at 1595 cm-1. © 2013 Copyright SPIE.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1117/12.2005448

✓ نام ژورنال:

Progress in Biomedical Optics and Imaging - Proceedings of SPIE

✓ سال انتشار:

2013

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Study of virus by Raman spectroscopy

✓ **نویسندگان**:

Moor K., Kitamura H., Hashimoto K., Sawa M., Andriana B.B., Ohtani K., Yagura T., Sato H.

✓ **خلاصه پژوهش**:

Problem of viruses is very actual for nowadays. Some viruses, which are responsible for human of all tumors, are about 15 %. Main purposes this study, early detection virus in live cell without labeling and in the real time by Raman spectroscopy. Micro Raman spectroscopy (mRs) is a technique that uses a Raman spectrometer to measure the spectra of microscopic samples. According to the Raman spectroscopy, it becomes possible to study the metabolites of a live cultured cell without labeling. We used mRs to detect the virus via HEK 293 cell line-infected adenovirus. We obtained raman specters of lives cells with viruses in 24 hours and 7 days after the infection. As the result, there is some biochemical changing after the treatment of cell with virus. One of biochemical alteration is at 1081 cm-1. For the clarification result, we use confocal fluorescent microscopy and transmission electron microscopy (TEM). © 2013 Copyright SPIE.

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

10.1117/12.2004476

✓ **نام ژورنال**:

Progress in Biomedical Optics and Imaging - Proceedings of SPIE

✓ **سال انتشار**:

2013

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Optical diagnosis of dengue virus infection in human blood serum using Raman spectroscopy

✓ **نویسندگان**:

Saleem M., Bilal M., Anwar S., Rehman A., Ahmed M.

✓ **خلاصه پژوهش**:

We present the optical diagnosis of dengue virus infection in human blood serum using Raman spectroscopy. Raman spectra were acquired from 18 blood serum samples using a laser at 532 nm as the excitation source. A multivariate regression model based on partial least-squares regression is developed that uses Raman spectra to predict dengue infection with leave-one-sample-out cross validation. The prediction of dengue infection by our model yields correlation coefficient r2 values of 0.9998 between the predicted and reference clinical results. The model was tested for six unknown human blood sera and found to be 100% accurate in accordance with the clinical results. © 2013 Astro Ltd.

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

10.1088/1612-2011/10/3/035602

✓ **نام ژورنال**:

Laser Physics Letters

✓ **سال انتشار**:

2013

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Detection and identification of cancerous murine fibroblasts, transformed by murine sarcoma virus in culture, using Raman spectroscopy and advanced statistical methods

✓ **نویسندگان**:

Salman A., Shufan E., Zeiri L., Huleihel M.

✓ **خلاصه پژوهش**:

Background Cancer is one of the leading worldwide causes of death. It may be induced by a variety of factors, including carcinogens, radiation, genetic factors, or DNA and RNA viruses. The early detection of cancer is critical for its successful therapy, which can result in complete recovery from some types of cancer. Methods Raman spectroscopy has been widely used in medicine and biology. It is a noninvasive, nondestructive, and water-insensitive technique that can detect changes in cells and tissues that are caused by different disorders, such as cancer. In this study, Raman spectroscopy was used for the identification and characterization of murine fibroblast cell lines (NIH/3T3) and malignant fibroblast cells transformed by murine sarcoma virus (NIH-MuSV) cells. Results Using principal component analysis and LDA it was possible to differentiate between the NIH/3T3 and NIH-MuSV cells with an 80-85% success rate based on their Raman shift spectra. Conclusions The best results for differentiation were achieved from spectra that were obtained from the rich membrane sites. General significance Because of its homogeneity and complete control of most factors affecting its growth, cell culture is a preferred model for the detection and identification of specific biomarkers related to cancer transformation or other cellular modifications. © 2012 Elsevier B.V. ALI Rights Reserved.

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

10.1016/j.bbagen.2012.11.023

✓ **نام ژورنال**:

Biochimica et Biophysica Acta - General Subjects

✓ **سال انتشار**:

2013

✓ **کلیدواژه** (Keywords):

✓ عنوان پژوهش:

Plasmonic nanorice antenna on triangle nanoarray for surface-enhanced Raman scattering detection of hepatitis B virus DNA

✓ نویسندگان:

Li M., Cushing S.K., Liang H., Suri S., Ma D., Wu N.

✓ خلاصه پژوهش:

The sensitivity and the limit of detection of Raman sensors are limited by the extremely small scattering cross section of Raman labels. Silver nanorice antennae are coupled with a patterned gold triangle nanoarray chip to create spatially broadened plasmonic "hot spots", which enables a large density of Raman labels to experience strong local electromagnetic field. Finite difference time domain simulations have confirmed that the quasi-periodic structure increases the intensity and the area of the surface plasmon resonance (SPR), which enhances the surface-enhanced Raman scattering (SERS) signal significantly. The SERS signal of the nanorice/DNA/nanoarray chip is compared with that of the nanorice/DNA/film chip. The SERS signal is greatly enhanced when the Ag nanorices are coupled to the periodic Au nanoarray instead of the planar film chip. The resulting spatially broadened SPR field enables the SERS biosensor with a limit of detection of 50 aM toward hepatitis B virus DNA with the capability of discriminating a single-base mutant of DNA. This sensing platform can be extended to detect other chemical species and biomolecules such as proteins and small molecules. © 2013 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/ac303387a

✓ نام ژورنال:

Analytical Chemistry

✓ سال انتشار:

2013

✓ کلیدواژه (Keywords):

✓ عنوان پژوهش:

Surface-enhanced Raman scattering detection of DNAs derived from virus genomes using au-coated paramagnetic nanoparticles

✓ نویسندگان:

Zhang H., Harpster M.H., Wilson W.C., Johnson P.A.

✓ خلاصه پژوهش:

A magnetic capture-based, surface-enhanced Raman scattering (SERS) assay for DNA detection has been developed which utilizes Au-coated paramagnetic nanoparticles (Au@PMPs) as both a SERS substrate and effective bioseparation reagent for the selective removal of target DNAs from solution. Hybridization reactions contained two target DNAs, sequence complementary reporter probes conjugated with spectrally distinct Raman dyes distinct for each target, and Au@PMPs conjugated with sequence complementary capture probes. In this case, target DNAs were derived from the RNA genomes of the Rift Valley Fever virus (RVFV) or West Nile virus (WNV). The hybridization reactions were incubated for a short period and then concentrated within the focus beam of an interrogating laser by magnetic pull-down. The attendant SERS response of each individually captured DNA provided a limit of detection sensitivity in the range 20-100 nM. X-ray diffraction and UV-vis analysis validated both the desired surface plasmon resonance properties and bimetallic composition of synthesized Au@PMPs, and UV-vis spectroscopy confirmed conjugation of the Raman dye compounds malachite green (MG) and erythrosin B (EB) with the RVFV and WNV reporter probes, respectively. Finally, hybridization reactions assembled for multiplexed detection of both targets yielded mixed MG/EB spectra and clearly differentiated peaks which facilitate the quantitative detection of each DNA target. On the basis of the simple design of a single-particle DNA detection assay, the opportunity is provided to develop magnetic capture-based SERS assays that are easily assembled and adapted for high-level multiplex detection using low-cost Raman instrumentation. © 2012 American Chemical Society.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/la204890t

✓ نام ژورنال:

Langmuir

✓ سال انتشار:

2012

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

The use of a handheld raman system for virus detection

✓ **نویسندگان**:

Song C., Driskell J.D., Tripp R.A., Cui Y., Zhao Y.

✓ **خلاصه پژوهش**:

The combination of surface enhanced Raman spectroscopy (SERS) with a handheld Raman system would lead to a powerful portable device for defense and security applications. The Thermo Scientific FirstDefender RM instrument is a 785-nm handheld Raman spectrometer intended for rapid field identification of unknown solid and liquid samples. Its sensitivity and effectiveness for SERS-based detection was initially confirmed by evaluating detection of 1,2-di(4-pyridyl)ethylene as a reporter molecule on a silver nanorod (AgNR) substrate, and the results are comparable to those from a confocal Bruker Raman system. As avian influenza A viruses (AIV) are recognized as an important emerging threat to public health, this portable handheld Raman spectrometer is used, for the first time, to detect and identify avian influenza A viruses using a multi-well AgNR SERS chip. The SERS spectra obtained had rich peaks which demonstrated that the instrument can be effectively used for SERS-based influenza virus detection. According to the SERS spectra, these different influenza viruses were distinguished from the negative control via the principal component analysis and by partial least squares-discriminate analysis. Together, these results show that the combination effective SERS substrates when combined with a portable Raman spectrometer provides a powerful field device for chemical and biological sensing. © 2012 SPIE.

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

10.1117/12.918758

✓ **نام ژورنال**:

Proceedings of SPIE - The International Society for Optical Engineering

✓ **سال انتشار**:

2012

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Near-infrared raman microspectroscopy detects high-risk human papillomaviruses1

✓ **نویسندگان**:

Vargis E., Tang Y.-W., Khabele D., Mahadevan-Jansen A.

✓ **خلاصه پژوهش**:

BACKGROUND: Detecting human papillomaviruses (HPVs) infection in cervical cells is an exceedingly important part of the clinical management of cervical dysplasia. Current guidelines in women's health outline the need for both the Papanicolaou test as well as high-risk HPV testing. Testing for HPV is expensive, is time-consuming, and requires experienced technicians. METHODS: Two sets of near-infrared Raman microspectroscopy experiments were conducted using a Raman confocal microscope system. First, Raman spectra were acquired from four different cell culture lines, two positive for HPV (HeLa, SiHa), one negative for HPV, but malignant (C33A), and one normal, HPV-negative line (NHEK). The three malignant lines were all derived from cervical cells. Second, Raman spectra were acquired from deidentified patient samples that were previously tested for the presence of high-risk HPV. RESULTS: The spectra from the cell culture lines and the patient samples contained many statistically significant differences. Using sparse multinomial logistic regression to classify the data led to classification accuracies of 89% to 97% for the cell culture samples and 98.5% for the patient samples. CONCLUSIONS: Raman microspectroscopy can be used to detect HPV and differentiate among specific HPV strains. This technique may provide health providers with a new method for quickly testing cell samples for the presence of HPV. © 2012 Neoplasia Press, Inc.

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

10.1593/tlo.12106

✓ **نام ژورنال**:

Translational Oncology

✓ **سال انتشار**:

2012

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ عنوان پژوهش:

HF-EPR, Raman, UV/VIS light spectroscopic, and DFT studies of the ribonucleotide reductase R2 tyrosyl radical from Epstein-Barr virus

✓ نویسندگان:

Tomter A.B., Zoppellaro G., Schmitzberger F., Andersen N.H., Barra A.-L., Engman H., Nordlund P., Andersson K.K.

✓ خلاصه پژوهش:

Epstein-Barr virus (EBV) belongs to the gamma subfamily of herpes viruses, among the most common pathogenic viruses in humans worldwide. The viral ribonucleotide reductase small subunit (RNR R2) is involved in the biosynthesis of nucleotides, the DNA precursors necessary for viral replication, and is an important drug target for EBV. RNR R2 generates a stable tyrosyl radical required for enzymatic turnover. Here, the electronic and magnetic properties of the tyrosyl radical in EBV R2 have been determined by X-band and high-field/high-frequency electron paramagnetic resonance (EPR) spectroscopy recorded at cryogenic temperatures. The radical exhibits an unusually low g 1-tensor component at 2.0080, indicative of a positive charge in the vicinity of the radical. Consistent with these EPR results a relatively high C-O stretching frequency associated with the phenoxyl radical (at 1508 cm -1) is observed with resonance Raman spectroscopy. In contrast to mouse R2, EBV R2 does not show a deuterium shift in the resonance Raman spectra. Thus, the presence of a water molecule as a hydrogen bond donor moiety could not be identified unequivocally. Theoretical simulations showed that a water molecule placed at a distance of 2.6 Å from the tyrosyl-oxygen does not result in a detectable deuterium shift in the calculated Raman spectra. UV/VIS light spectroscopic studies with metal chelators and tyrosyl radical scavengers are consistent with a more accessible dimetal binding/radical site and a lower affinity for Fe 2+ in EBV R2 than in Escherichia coli R2. Comparison with previous studies of RNR R2s from mouse, bacteria, and herpes viruses, demonstrates that finely tuned electronic properties of the radical exist within the same RNR R2 Ia class. © 2011 Tomter et al.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1371/journal.pone.0025022

✓ نام ژورنال:

PLoS ONE

✓ سال انتشار:

2011

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Micro-Raman spectroscopy study of ALVAC virus infected chicken embryo cells

✓ **نویسندگان**:

Misra A.K., Kamemoto L.E., Hu N., Dykes A.C., Yu Q., Zinin P.V., Sharma S.K.

✓ **خلاصه پژوهش**:

Micro- Raman spectroscopic investigation of ALVAC virus and of normal chicken embryo fibroblast cells and the cells infected with ALVAC virus labeled with green fluorescence protein (GFP) were performed with a 785 nm laser. Good quality Micro-Raman spectra of the Alvac II virus were obtained. These spectra show that the ALVAC II virus contains buried tyrosine residues and the coat protein of the virus has α-helical structure. A comparison of Raman spectra of normal and virus infected chicken embryo fibroblast cells revealed that the virus infected cells show additional bands at 535, 928, and 1091 cm-1, respectively, corresponding to δ(C-O-C) glycosidic ring, protein α-helix, and DNA (O-P-O) modes. In addition, the tyrosine resonance double (833 and 855 cm-1) shows reversal in the intensity of the higher-frequency band as compared to the normal cells that can be used to identify the infected cells. In the C-H stretching region, the infected cells show bands with higher intensity as compared to that of the corresponding bands in the normal cells. We also found that the presence of GFP does not affect the Raman spectra of samples when using a 785 nm micro-Raman system because the green fluorescence wavelength of GFP is well below the Stokes-Raman shifted spectral region. © 2011 Copyright Society of Photo-Optical Instrumentation Engineers (SPIE).

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

10.1117/12.887165

✓ **نام ژورنال**:

Progress in Biomedical Optics and Imaging - Proceedings of SPIE

✓ **سال انتشار**:

2011

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Focused ion beam-fabricated Au micro/nanostructures used as a surface enhanced Raman scattering-active substrate for trace detection of molecules and influenza virus

✓ نویسندگان:

Lin Y.-Y., Liao J.-D., Ju Y.-H., Chang C.-W., Shiau A.-L.

✓ خلاصه پژوهش:

The focused ion beam (FIB) technique was used to precisely fabricate patterned Au micro/nanostructures (fibAu). The effects of surface enhanced Raman scattering (SERS) on the fibAu samples were investigated by adjusting the geometrical, dimensional, and spacing factors. The SERS mechanism was evaluated using low-concentration rhodamine 6G (R6G) molecules, physically adsorbed or suspended on/within the micro/nanostructures. The results indicated that for detecting R6G molecules, hexagon-like micro/nanostructures induced a higher electromagnetic mechanism (EM) due to the availability of multiple edges and small curvature. By decreasing the dimensions from 300 to 150nm, the laser-focused area contained an increasing number of micro/nanostructures and therefore intensified the excitation of SERS signals. Moreover, with an optimized geometry and dimensions of the micro/nanostructures, the relative intensity/surface area value reached a maximum as the spacing was 22nm. An exponential decrease was found as the spacing was increased, which most probably resulted from the loss of EM. The spacing between the micro/nanostructures upon the fibAu was consequently regarded as the dominant factor for the detection of R6G molecules. By taking an optimized fibAu to detect low-concentration influenza virus, the amino acids from the outermost surface of the virus can be well distinguished through the SERS mechanism. © 2011 IOP Publishing Ltd.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1088/0957-4484/22/18/185308

✓ نام ژورنال:

Nanotechnology

✓ سال انتشار:

2011

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Evaluation of tip-enhanced Raman spectroscopy for characterizing different virus strains

✓ **نویسندگان**:

Hermann P., Hermelink A., Lausch V., Holland G., Möller L., Bannert N., Naumann D.

✓ **خلاصه پژوهش**:

Tip-enhanced Raman spectroscopy (TERS) is a highly sensitive spectroscopic technique which combines the advantages of optical spectroscopy with the requirements needed for the characterization of biological nano-structures. In this study, TERS was used to investigate the applicability of this spectroscopic technique for the detection of different virus strains like avipoxvirus and adeno-associated virus. TERS spectra obtained from different particles of the same virus strain show variations in relative peak intensities and positions of most spectral features observed. These spectral variations were higher for the larger avipoxvirus particles (ø ≈ 350 nm) than for the smaller adeno-associated virus particles (ø ≈ 26 nm). © 2011 The Royal Society of Chemistry.

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

10.1039/c0an00531b

✓ **نام ژورنال**:

Analyst

✓ **سال انتشار**:

2011

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Surface-enhanced raman scattering detection of DNA derived from the west nile virus genome using magnetic capture of raman-active gold nanoparticles

✓ **نویسندگان**:

Zhang H., Harpster M.H., Park H.J., Johnson P.A., Wilson W.C.

✓ **خلاصه پژوهش**:

A model paramagnetic nanoparticle (MNP) assay is demonstrated for surface-enhanced Raman scattering (SERS) detection of DNA oligonucleotides derived from the West Nile virus (WNV) genome. Detection is based on the capture of WNV target sequences by hybridization with complementary oligonucleotide probes covalently linked to fabricated MNPs and Raman reporter tag-conjugated gold nanoparticles (GNPs) and the subsequent removal of GNP-WNV target sequence-MNP hybridization complexes from solution by an externally applied magnetic source. Laser excitation of the pelleted material provided a signature SERS spectrum which is diagnostic for the reporter, 5,5′- dithiobis(succinimidy-2-nitrobenzoate) (DSNB), and restricted to hybridization reactions containing WNV target sequences. Hybridizations containing dilutions of the target oligonucleotide were characterized by a reduction in the intensification of the spectral peaks accorded to the SERS signaling of DSNB, and the limit of detection for target sequence in buffer was 10 pM. Due to the short hybridization times required to conduct the assay and ease with which reproducible Raman spectra can be acquired, the assay is amenable to adaptation within a portable, user-friendly Raman detection platform for nucleic acids. © 2010 American Chemical Society.

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

10.1021/ac1023843

✓ **نام ژورنال**:

Analytical Chemistry

✓ **سال انتشار**:

2011

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Rapid and sensitive detection of rotavirus molecular signatures using surface enhanced raman spectroscopy

✓ **نویسندگان**:

Driskell J.D., Zhu Y., Kirkwood C.D., Zhao Y., Dluhy R.A., Tripp R.A.

✓ **خلاصه پژوهش**:

Human enteric virus infections range from gastroenteritis to life threatening diseases such as myocarditis and aseptic meningitis. Rotavirus is one of the most common enteric agents and mortality associated with infection can be very significant in developing countries. Most enteric viruses produce diseases that are not distinct from other pathogens, and current diagnostics is limited in breadth and sensitivity required to advance virus detection schemes for disease intervention strategies. A spectroscopic assay based on surface enhanced Raman scattering (SERS) has been developed for rapid and sensitive detection of rotavirus. The SERS method relies on the fabrication of silver nanorod array substrates that are extremely SERS-active allowing for direct structural characterization of viruses. SERS spectra for eight rotavirus strains were analyzed to qualitatively identify rotaviruses and to classify each according to G and P genotype and strain with >96% accuracy, and a quantitative model based on partial least squares regression analysis was evaluated. This novel SERS-based virus detection method shows that SERS can be used to identify spectral fingerprints of human rotaviruses, and suggests that this detection method can be used for pathogen detection central to human health care. © 2010 Driskell et al.

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

10.1371/journal.pone.0010222

✓ **نام ژورنال**:

PLoS ONE

✓ **سال انتشار**:

2010

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Detecting food- and waterborne viruses by surface-enhanced raman spectroscopy

✓ نویسندگان:

Fan C., Hu Z., Riley L.K., Purdy G.A., Mustapha A., Lin M.

✓ خلاصه پژوهش:

Food- and waterborne viruses pose serious health risks to humans and were associated with many outbreaks worldwide. Rapid, accurate, and nondestructive methods for detection of viruses are of great importance to protect public health. In this study, surface-enhanced Raman spectroscopy (SERS) coupled with gold SERS-active substrates was used to detect and discriminate 7 food- and waterborne viruses, including norovirus, adenovirus, parvovirus, rotavirus, coronavirus, paramyxovirus, and herpersvirus. Virus samples were purified and dialyzed in phosphate buffered saline (8 to 9 log PFU/mL) and then further diluted in deionized water for SERS measurement. After capturing the characteristic SERS spectral patterns, multivariate statistical analyses, including soft independent modeling of class analogy (SIMCA) and principal component analysis (PCA), were employed to analyze SERS spectral data for characterization and identification of viruses. The results show that SIMCA was able to differentiate viruses with and without envelope with >95% of classification accuracy, while PCA presented clear spectral data segregations between different virus strains. The virus detection limit by SERS using gold substrates reached a titer of 102. Practical Application:: SERS is a simple, rapid, and accurate method for detection of food- and waterborne viruses. Our results demonstrate that coupled with gold substrates, SERS was able to rapidly detect and discriminate among different food- and waterborne viruses, indicating that SERS can provide rapid, sensitive, and reproducible detection results with minimum sample preparation for virus detection.
© 2010 Institute of Food Technologists®.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1111/j.1750-3841.2010.01619.x

✓ نام ژورنال:

Journal of Food Science

✓ سال انتشار:

2010

✓ کلیدواژه (Keywords):

✓ **عنوان پژوهش**:

Atomistic modeling of the low-frequency mechanical modes and Raman spectra of icosahedral virus capsids

✓ **نویسندگان**:

Dykeman E.C., Sankey O.F.

✓ **خلاصه پژوهش**:

We describe a technique for calculating the low-frequency mechanical modes and frequencies of a large symmetric biological molecule where the eigenvectors of the Hessian matrix are determined with full atomic detail. The method, which follows order N methods used in electronic structure theory, determines the subset of lowest-frequency modes while using group theory to reduce the complexity of the problem. We apply the method to three icosahedral viruses of various T numbers and sizes; the human viruses polio and hepatitis B, and the cowpea chlorotic mottle virus, a plant virus. From the normal-mode eigenvectors, we use a bond polarizability model to predict a low-frequency Raman scattering profile for the viruses. The full atomic detail in the displacement patterns combined with an empirical potential-energy model allows a comparison of the fully atomic normal modes with elastic network models and normal-mode analysis with only dihedral degrees of freedom. We find that coarse-graining normal-mode analysis (particularly the elastic network model) can predict the displacement patterns for the first few (~10) low-frequency modes that are global and cooperative.
© 2010 The American Physical Society.

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

10.1103/PhysRevE.81.021918

✓ **نام ژورنال**:

Physical Review E - Statistical, Nonlinear, and Soft Matter Physics

✓ **سال انتشار**:

2010

✓ **کلیدواژه** (Keywords):

✓ **عنوان پژوهش**:

Identification of individual genotypes of measles virus using surface enhanced Raman spectroscopy

✓ **نویسندگان**:

Hoang V., Tripp R.A., Rota P., Dluhy R.A.

✓ **خلاصه پژوهش**:

A spectroscopic assay based on surface-enhanced Raman spectroscopy (SERS) has been developed for rapid genotyping of the measles virus (MeV). Silver nanorods fabricated using an oblique angle vapor deposition method acted as the SERS-active substrate. The SERS spectra of four separate MeV genotypes, i.e. A, H1, D4 and D9, and two separate negative media control samples were analyzed using multivariate statistical methods. Principal components analysis (PCA) and hierarchical cluster analysis (HCA) successfully separated three of the four MeV genotypes studied. The MeV genotypes used in this study had >96% sequence similarity as monitored using the MeV hemagglutinin (H) gene, and the clustering seen in PCA and HCA mirrored this sequence diversity. For example, the MeV genotypes with the highest sequence diversity (~3%, A and H1) were the most widely separated in the PCA scores plot and HCA dendogram. Conversely, the MeV genotypes with the lowest sequence diversity (~0.5%, D4 and D9) could not be statistically differentiated. However, a supervised chemometric method, partial least squares-discriminant analysis (PLS-DA) was able to separate each of the four MeV strains, the two negative controls, and the background, with >90% sensitivity and >96% selectivity based solely on their inherent SERS spectra. These results demonstrate that SERS, in combination with multivariate statistical methods, is a highly sensitive and rapid viral identification and classification method that can be applied to MeV genotyping. © 2010 The Royal Society of Chemistry.

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

10.1039/c0an00453g

✓ **نام ژورنال**:

Analyst

✓ **سال انتشار**:

2010

✓ **کلیدواژه** (Keywords):

✓ **عنوان پژوهش**:

Raman Spectroscopy of Viruses and Viral Proteins

✓ **نویسندگان**:

Němeček D., Thomas G.J.

✓ **خلاصه پژوهش**:

Biological applications of Raman spectroscopy are of great advantage over infrared spectroscopy because of both the relatively low interference of water in the Raman effect and the diversity of sample states amenable to Raman analysis. These considerations facilitate the correlation of biomolecular solution structures with corresponding high-resolution structures determined by X-ray crystallography. This chapter considers the implementation of methods of Raman spectroscopy, ultraviolet resonance Raman (UVRR) spectroscopy, and polarized Raman spectroscopy as structural probes of native viruses, precursor viral assemblies, and their constituent proteins and nucleic acids. Focus is on recent applications from the author's laboratory to icosahedral (P22 and HK97) and filamentous (fd, Pf1, Pf3, and PH75) bacteriophages. These studies provide novel insights into the many macromolecular structural transformations-including conformational rearrangements of viral proteins and nucleic acids and site-specific interactions of key molecular subgroups-that define the viral morphogenetic pathway. Emphasis is given to structural, thermodynamic, and kinetic information that is well suited to investigation by Raman methods and cannot be addressed by alternative biophysical probes. Experimental requirements appropriate to each Raman application are considered. The chapter also reviews the application of the singular value decomposition (SVD) algorithm for quantitative treatment of Raman spectroscopic data collected from viral proteins and related biological molecules. It focuses on bacterial viruses that comprise only protein and nucleic acid constituents. © 2009 Elsevier B.V. All rights reserved.

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

10.1016/B978-0-444-53175-9.00016-7

✓ **نام ژورنال**:

Frontiers of Molecular Spectroscopy

✓ **سال انتشار**:

2009

✓ **کلیدواژه** (Keywords):

✓ **عنوان پژوهش**:

Optofluidic surface enhanced Raman scattering chip for detection of dengue virus

✓ **نویسندگان**:

Yun S.H., Chung A.J., Cordovez B., Erickson D.

✓ **خلاصه پژوهش**:

In this work we describe the development of an optofluidic device for surface enhanced Raman scattering (SERS) based detection of biological pathogens. The chip exploits the use of electro-active microwells which serve to both physically concentrate the Raman enhancers and to reduce the total analysis time through a unique electrokinetically driven on-chip mixing effect. To quantify the concentralion performance of the device we use 44 nm polystyrene particles at low electric field strength (between 1.00-2.00 V) and demonstrate close to 90% concentration saturation within 2.5 s. We demonstrate the mixing capability through the enhanced detection of dengue virus serotype 2 (DENV-2). With DENV-2, we successfully detected the SERS signals with a limit of detection of 30 pM. Copyright © 2008 by ASME.

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

10.1115/IMECE2008-67243

✓ **نام ژورنال**:

ASME International Mechanical Engineering Congress and Exposition, Proceedings

✓ **سال انتشار**:

2009

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Raman to the limit: Tip-enhanced Raman spectroscopic investigations of a single tobacco mosaic virus

✓ **نویسندگان**:

Cialla D., Deckert-Gaudig T., Budich C., Laue M., Möller R., Naumann D., Deckert V., Popp J.

✓ **خلاصه پژوهش**:

The development of fast identification techniques of viruses is an ongoing important research topic, Conventional virus detection and identification is generally based on various different microbiological methods. However, these techniques are not suitable for the analysis of single virus particles. Therefore, our goal is to establish tip-enhanced Raman scattering (TERS), providing vibrational spectroscopic information with a spatial resolution less than 50 nm, to characterize single viruses at a molecular level. Here we report, to the best of our knowledge for the first time, about TERS spectra of a tobacco mosaic virus, showing the great capability of this technique. However, the application of the TERS technique for a rapid and direct detection of different species of single viruses is under development, which is useful for a wide range of analytical fields. Copyright © 2009 John Wiley & Sons, Ltd.

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

10.1002/jrs.2123

✓ **نام ژورنال**:

Journal of Raman Spectroscopy

✓ **سال انتشار**:

2009

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Surface-enhanced raman spectroscopy: A new approach to rapid identification of intact viruses

✓ **نویسندگان**:

Alexander T.A.

✓ **خلاصه پژوهش**:

Surface-enhanced Raman Spectroscopy (SERS) substrate assessment methodology was used for identification of intact Poxviridae virions. Intrinsic SERS spectral signatures of BPSV (bovine papular stomatitis virus) and PCPV (pseudocowpox virus), closely related to smallpox acquired with these substrates have been used as a basis set to develop a computer-borne PLS2 (partial least square) predictive model. Results of the analysis show that the substrates are sensitive, spatially uniform, and reproducible from substrate to substrate. High spatial uniformity and substrate-to-substrate reproducibility teamed with availability from a commercial source makes these substrate a major candidate to be used as the foundation in the development of new surface-enhanced property approaches.

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

✓ **نام ژورنال**:

Spectroscopy (Santa Monica)

✓ **سال انتشار**:

2008

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Inactivation of viruses with a femtosecond laser via impulsive stimulated Raman scattering

✓ **نویسندگان**:

Tsen K.T., Tsen S.-W.D., Chang C.-L., Hung C.-F., Wu T.-C., Ramakrishna B., Mossman K., Kiang J.G.

✓ **خلاصه پژوهش**:

The inactivation of viruses such as M13 bateriophages subject to excitations by a very low power visible femtosecond laser has been studied. Our experimental results show that for a visible femtosecond laser having λ = 425nm and a pulse width of 100 fs, the M13 bacteriophages are inactivated when the laser power density is greater than or equal to 50 MW / cm2. The functionality of M13 bacteriophages has been shown to be critically dependent on the pulse width as well as power density of the excitation laser. Our work demonstrates that by using a very low power visible femtosecond laser, it is plausible to inactivate viruses such as the M13 bacteriophages through Impulsive Stimulated Raman Scattering (ISRS) process. These experimental findings lay down the foundation for a novel new avenue of selectively inactivating microorganisms while leaving the sensitive materials unharmed by manipulating and controlling with femtosecond laser systems.

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

10.1117/12.762324

✓ **نام ژورنال**:

Progress in Biomedical Optics and Imaging - Proceedings of SPIE

✓ **سال انتشار**:

2008

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Identification and classification of respiratory syncytial virus (RSV) strains by surface-enhanced Raman spectroscopy and multivariate statistical techniques

✓ **نویسندگان**:

Dluhy R.A., Shanmukh S., Jones L., Zhao Y.-P., Driskell J.D., Tripp R.A.

✓ **خلاصه پژوهش**:

There is a critical need for a rapid and sensitive means of detecting viruses. Recent reports from our laboratory have shown that surface-enhanced Raman spectroscopy (SERS) can meet these needs. In this study, SERS was used to obtain the Raman spectra of respiratory syncytial virus (RSV) strains A/Long, B1, and A2. SERS-active substrates composed of silver nanorods were fabricated using an oblique angle vapor deposition method. The SERS spectra obtained for each virus were shown to posses a high degree of reproducibility. Based on their intrinsic SERS spectra, the four virus strains were readily detected and classified using the multivariate statistical methods principal component analysis (PCA) and hierarchical cluster analysis (HCA). The chemometric results show that PCA is able to separate the three virus strains unambiguously, whereas the HCA method was able to readily distinguish an A2 strain-related G gene mutant virus (ΔG) from the A2 strain. The results described here demonstrate that SERS, in combination with multivariate statistical methods, can be utilized as a highly sensitive and rapid viral identification and classification method. © 2008 Springer-Verlag.

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

10.1007/s00216-008-1851-0

✓ **نام ژورنال**:

Analytical and Bioanalytical Chemistry

✓ **سال انتشار**:

2008

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Erratum: Acoustic phonon quantization and low-frequency Raman spectra of spherical viruses (Physical Review E (2006) 73 (011901))

✓ **نویسندگان**:

Talati M., Jha P.K.

✓ **خلاصه پژوهش**:

[No abstract available]

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

10.1103/PhysRevE.77.029904

✓ **نام ژورنال**:

Physical Review E - Statistical, Nonlinear, and Soft Matter Physics

✓ **سال انتشار**:

2008

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Surface enhanced Raman scattering of herpes simplex virus in tear film

✓ **نویسندگان**:

Reyes-Goddard J.M., Barr H., Stone N.

✓ **خلاصه پژوهش**:

Conjunctivitis is currently diagnosed using white light microscopy of corneal or conjunctival cells in culture. This takes time and is subjective. An ideal test would be sensitive, specific, near-patient and quick. Raman spectroscopy is the measurement of inelastic light scatter that produces unique molecular spectra. Infected human tear film can be analysed for viral and bacterial particles. However, the concentration of these and the constituents of the tear are very low. Surface enhanced Raman scattering can be used to amplify the Raman signal. For this experiment two different SERS substrates were used: silver mirror reaction glass and gold thin film. Heat denatured herpes simplex virus in transport medium culture and transport medium only were added to different ratios of a synthetic tear. The synthetic tear was modelled on the aqueous layer of the human tear film. Linear discriminant analysis was performed on each spectral dataset for each ratio of mixture on both substrates. From the classification tables, the sensitivity and specificity for silver mirror reaction glass were 75.5 ± 13.8%, 77.3 ± 8.3%, and for gold thin film 75.5 ± 5.9% and 78.3 ± 6.2% respectively. The results show proof of principle that SERS could potentially be used to detect the presence of herpes simplex viral particles in an aqueous solution such as the tear film. © 2008 Elsevier B.V. All rights reserved.

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

10.1016/j.pdpdt.2008.01.002

✓ **نام ژورنال**:

Photodiagnosis and Photodynamic Therapy

✓ **سال انتشار**:

2008

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Inactivation of viruses by laser-driven coherent excitations via impulsive stimulated Raman scattering process

✓ **نویسندگان**:

Tsen K.-T., Tsen S.-W.D., Chang C.-L., Hung C.-F., Wu T.-C., Kiang J.G.

✓ **خلاصه پژوهش**:

The inactivation of viruses such as M13 bacteriophages subject to excitations by a very low power visible femtosecond laser has been studied. Our experimental results show that for a visible femtosecond laser having λ=425 nm and a pulse width of 100 fs, the M13 bacteriophages are inactivated when the laser power density is greater than or equal to 49 MW cm2. The medium lethal laser power density (LD50) is 51.94±0.14 MW cm2. The functionality of M13 bacteriophages has been shown to be critically dependent on the pulse width as well as power density of the excitation laser. Our work demonstrates that by using a very low power visible femtosecond laser, it is plausible to inactivate viruses such as the M13 bacteriophages through impulsive stimulated Raman scattering process. These experimental findings suggest a novel avenue of selectively inactivating microorganisms while leaving the sensitive materials unharmed by manipulating and controlling with femtosecond laser systems. © 2007 Society of Photo-Optical Instrumentation Engineers.

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

10.1117/1.2821713

✓ **نام ژورنال**:

Journal of Biomedical Optics

✓ **سال انتشار**:

2007

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Core protein-nucleic acid interactions in hepatitis C virus as revealed by raman and circular dichroism spectroscopy

✓ **نویسندگان**:

Rodríguez-Casado A., Molina M., Carmona P.

✓ **خلاصه پژوهش**:

Molecular interactions required for hepatitis C virus (HCV) assembly are not well known and are poorly understood. The 5′ untranslated region (5′UTR) of the RNA genome is highly conserved and has extensive secondary structure, and the highly basic core protein is rich in arginine residues. Using Raman and circular dichroism (CD) spectroscopies, specific interactions have been demonstrated here between the 5′UTR sequence and the core protein that may be important for the specific encapsidation of the viral genome during HCV replication. These interactions can be described as follows: (1) hydrogen bonding of arginine with unpaired guanine and/or with wobble GU base pairs, and argininephosphate electrostatic contacts; (2) although the percentage of base pairs in the A-form is maintained in 5′UTR, the HCVc-120 protein is β-sheet and α-helix enriched upon formation of protein-5′UTR macromolecular assemblies; (3) protein-5′UTR interactions resulting in protein α-helix formation involve guanine bases in duplex segments. The mentioned interactions may represent novel targets for antiviral strategies against this important virus. © 2007 Society for Applied Spectroscopy.

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

10.1366/000370207782597139

✓ **نام ژورنال**:

Applied Spectroscopy

✓ **سال انتشار**:

2007

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Raman intensity and spectra predictions for cylindrical viruses

✓ **نویسندگان**:

Dykeman E.C., Sankey O.F., Tsen K.-T.

✓ **خلاصه پژوهش**:

A theoretical framework for predicting low frequency Raman vibrational spectra of viral capsids is presented and applied to the M13 bacteriophage. The method uses a continuum elastic theory for the vibrational modes and a bond-charge polarizability model of an amorphous material to roughly predict the Raman intensities. Comparison is made to experimental results for the M13 bacteriophage virus. © 2007 The American Physical Society.

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

10.1103/PhysRevE.76.011906

✓ **نام ژورنال**:

Physical Review E - Statistical, Nonlinear, and Soft Matter Physics

✓ **سال انتشار**:

2007

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Hybrid organic-inorganic nanoparticles: Controlled incorporation of gold nanoparticles into virus-like particles and application in surface-enhanced Raman spectroscopy

✓ نویسندگان:

Niebert M., Riches J., Howes M., Ferguson C., Parton R.G., Middelberg A.P.J., Rintoul L., Fredericks P.M.

✓ خلاصه پژوهش:

A capsid is the protein coat surrounding a virus' genome that ensures its protection and transport. The capsid of murine polyomavirus (muPy) consists of one major (VP1) and two minor (VP2/3) proteins, from which just VP1 is sufficient to form the capsid when expressed recombinantly (1). From a material engineering point of view, viral capsids are of interest because they present a paradigm for complex self-assembly on the nanometer scale. Understanding and controlling these assembly dynamics will allow the construction of nanoscale structures using a self-assembly process. The first step in this direction was the discovery that capsids of several viruses can be reversibly disassembled into their building blocks and reassembled using the same building blocks by simply changing the buffer conditions (2, 3). Such capsids already find applications as targeted in vivo delivery vectors for genes, proteins or small molecular drugs (4, 5), as optical probes for biomedical imaging and sensing purposes with unprecedented resolution and sensitivity and can potentially be used as templates for nanoelectronics (6, 7). Here we show the controlled incorporation of inorganic gold nanoparticles into the capsid shell of muPy. This incorporation is mediated by covalent sulfide bonds between the capsid proteins cysteine residues and the molecular gold. The number of incorporated gold particles can be controlled during the assembly process and the capsids retain their ability to transduce cells. These particles provide new tools for tracking of viral particles in cells, and simultaneously allow the delivery of genes packages in the hollow capsid.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1117/12.695578

✓ نام ژورنال:

Proceedings of SPIE - The International Society for Optical Engineering

✓ سال انتشار:

2007

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Probing the low-frequency vibrational modes of viruses with Raman scattering - Bacteriophage M13 in water

✓ **نویسندگان**:

Tsen K.T., Dykeman E.C., Sankey O.F., Tsen S.-W.D., Lin N.-T., Kiang J.G.

✓ **خلاصه پژوهش**:

Raman spectroscopy is used to study low-wave-number (≤ 20 cm -1) acoustic vibrations of the M13 phage. A well-defined Raman line is observed at around 8.5 cm-1. The experimental results are compared with theoretical calculations based on an elastic continuum model and appropriate Raman selection rules derived from a bond polarizability model. The observed Raman mode is shown to belong to one of the Raman-active axial modes of the M13 phage protein coat. It is expected that the detection and characterization of this low-frequency vibrational mode can be used for applications in biomedical nanotechnology such as for monitoring the process of virus functionalization and self-assembly. © 2007 Society of Photo-Optical Instrumentation Engineers.

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

10.1117/1.2718935

✓ **نام ژورنال**:

Journal of Biomedical Optics

✓ **سال انتشار**:

2007

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Surface-enhanced Raman spectroscopy detects viruses

✓ **نویسندگان**:

Shenkenberg D.

✓ **خلاصه پژوهش**:

[No abstract available]

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

✓ **نام ژورنال**:

Biophotonics International

✓ **سال انتشار**:

2006

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Detection of viruses: Atomic force microscopy and surface enhanced Raman spectroscopy

✓ **نویسندگان**:

Porter M.D., Driskell J.D., Kwarta K.M., Lipert R.J., Neill J.D., Ridpath J.F.

✓ **خلاصه پژوهش**:

This paper demonstrates the capability of atomic force microscopy (AFM) and surface enhanced Raman spectroscopy (SERS) to function effectively as ultra-sensitive readout tools for chip-scale platforms designed for pathogen detection in complex biological media. AFM allows direct (i.e., label-free) visualization and quantification of nanometer-sized viruses captured on a smooth, selective surface. AFM readout led to optimization of a capture substrate for feline calicivirus (FCV), and yielded a limit of detection of 3 × 106 FCV/mL. SERS-based detection of FCV, carried out in a sandwich-type assay, requires labelling of the substrate-bound FCV with a selective extrinsic Raman label (ERL). These studies yielded a limit of detection of 1 × 106 FCV/mL. The prospects of these two readout methods as additions to the arsenal of tools in bioterrorism prevention are briefly discussed.

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

✓ **نام ژورنال**:

Developments in Biologicals

✓ **سال انتشار**:

2006

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Acoustic phonon quantization and low-frequency Raman spectra of spherical viruses

✓ **نویسندگان**:

Talati M., Jha P.K.

✓ **خلاصه پژوهش**:

Low-frequency vibrational modes are calculated using elastic continuum approximation model for spherical viruses immersed in a medium. The blueshift in the vibrational modes is observed with decrease in the virus particle size. To incorporate the effect of surrounding environment, the anisotropic and finite medium is taken into account. The presence of medium significantly affects the Raman peaks representing acoustic modes and results into the linewidth broadening accompanied by damping of modes. The estimated damping constant and quality factor suggest less loss of energy of the fundamental breathing mode in the virus-glycerol configuration. The temperature effect on the virus results into the redshift of the low-frequency Raman peaks with increase in temperature. Significant differences in Raman spectra of wet and dry lysozyme are observed. The conformational changes are more prominent at low temperature for virus-water configuration suggesting that water works as a low energy barrier for conformational changes of spherical virus. © 2006 The American Physical Society.

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

10.1103/PhysRevE.73.011901

✓ **نام ژورنال**:

Physical Review E - Statistical, Nonlinear, and Soft Matter Physics

✓ **سال انتشار**:

2006

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Spectroscopic analysis of Kaposi's sarcoma-associated herpesvirus infected cells by Raman tweezers

✓ **نویسندگان**:

Hamden K.E., Bryan B.A., Ford P.W., Xie C., Li Y.-Q., Akula S.M.

✓ **خلاصه پژوهش**:

Kaposi's sarcoma-associated herpesvirus (KSHV), also referred to as human herpesvirus-8 (HHV-8), is a tumor causing virus. KSHV is the cause of several disease conditions known as Kaposi's sarcoma, multicentric Castleman disease, and primary effusion lymphoma. Cell culture supernatants from KSHV infected hematopoietic cells induced angiogenic tubule formation to a significantly greater extent than uninfected hematopoietic cells. Raman spectrum profiles were generated to differentiate the uninfected from KSHV infected cells. In general, profiles from all the hematopoietic cells shared similar peaks; however, the relative abundance of specific components varied significantly between the cells. Subsequent use of the multivariate analysis of the Raman spectra revealed significant differences between the uninfected and the KSHV infected cells. Taken together, this study reports the use of Raman tweezers to distinguish and analyze the biological relevance of KSHV infected cell signaling. © 2005 Elsevier B.V. All rights reserved.

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

10.1016/j.jviromet.2005.05.018

✓ **نام ژورنال**:

Journal of Virological Methods

✓ **سال انتشار**:

2005

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Raman spectroscopic study on structure of human immunodeficiency virus (HIV) and hypericin-induced photosensitive damage of HIV

✓ نویسندگان:

Xu Y., Lu C.

✓ خلاصه پژوهش:

The first Raman spectra of HIV1-HIV2 in human sera and hypericin-induced photosensitive damage of the virus have been obtained. The prominent Raman lines in the spectra are assigned respectively to the carbohydrates of viral glycoprotein, RNA, protein and lipid. The spectra are dominated by Raman scattering of the carbohydrates. The lines of D-Mannose and N-acetylglucosamine in carbohydrates are obvious and there is a β-configuration in the anomeric C1 position in D-Mannose. The viral RNA duplexes bound assumes an A-form geometry. The lines of backbone phosphate group, bases (involving interbase hydrogen bonding) and ribose of the RNA are complete and distinct. The secondary structure of the viral protein maintains α-helix, β-sheet, β-turn and random coil. Its side chains are rich and vary from tryptophan, phenylalanine and "buried" tyrosine; the stable conformation of the S-S bond of gauche-gauche-gauche; the two forms of C-S bonds of gauche and trans; to sulfhydrl group and ionized and unionized carboxyl groups. The viral lipid bilayer molecules are probably in the liquid ordered phase or the gel phase. It was observed that the hypericin-induced photosensitive damage of HIV1-HIV2 in human sera changed various components of HIV1-HIV2 in different degrees: The orderly A-form viral RNA would become a disordered viral RNA. There were a breakage of interbase hydrogen bonds and disruption of vertical base-base stacking interactions. In addition, the groups of ribos and four bases were damaged obviously. A decrease in ordered structure (α-helix and β-sheet) of viral protein is accompanied by an increase in random coil. The Tyr buried in the three-dimensional structure of protein was damaged, but it was still "buried" and the damage of C-S bond of trans form was stronger. The groups of carbohydrates, including D-Mannos and N-acetyl glucosamine, in viral envelope glycoprotein had also been changed. The hydrophilic C-N bond of choline in viral lipid was damaged, which was the possible binding site to hypericin, whereas the viral lipids bilayers were still probably in the liquid ordered phase or the gel phase. So the space structure of HIV1-HIV2 was damaged under the experimental conditions, which might block viral infection and inhibit its growth and breeding. It is apparent that the laser Raman spectra have provided certain direct evidence at the molecular level for photosensitive damage of HIV1-HIV2. Copyright by Science in China Press 2005.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1360/04yc0015

✓ نام ژورنال:

Science in China, Series C: Life Sciences

✓ سال انتشار:

2005

✓ کلیدواژه (Keywords):

✓ عنوان پژوهش:

A study of α-helix hydration in polypeptides, proteins, and viruses using vibrational Raman optical activity

✓ نویسندگان:

McColl I.H., Blanch E.W., Hecht L., Barron L.D.

✓ خلاصه پژوهش:

A vibrational Raman optical activity (ROA) study, supplemented by protein X-ray crystal structure data, of (α-helices in polypeptides, proteins, and viruses has suggested that ROA bands in the extended amide III spectral region may be used to distinguish between two types of right-handed α-helix. One type, associated with a positive ROA band at ∼1300 cm-1, dominates in hydrophobic environments and appears to be unhydrated; the other, associated with a positive ROA band at ∼1340 cm-1, dominates in hydrophilic environments and appears to be hydrated. Evidence is presented to support the hypothesis that unhydrated α-helix corresponds to the canonical conformation αc and hydrated α-helix to a more open conformation αo stabilized by hydrogen bonding of a water molecule or a hydrophilic side chain to the peptide carbonyl. α-Helical poly(L-lysine) and poly(L-ornithine) in aqueous solution and poly(L-alanine) in dichloracetic acid display both bands, but α-helical poly(L-glutamic acid) in aqueous solution and poly(γ-benzyl L-glutamate) in CHCl3 display only the ∼1340 cm-1 band and so may exist purely as αo due to enhanced stabilization of this conformation by particular side chain characteristics. The ROA spectrum of poly(β-benzyl L-aspartate) in CHCl3 reveals that it exists in a single left-handed α-helical state more analogous to αo than to αc.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/ja048991u

✓ نام ژورنال:

Journal of the American Chemical Society

✓ سال انتشار:

2004

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Structural characterization of proteins and viruses using Raman optical activity

✓ **نویسندگان**:

Blanch E.W., McColl I.H., Hecht L., Nielsen K., Barron L.D.

✓ **خلاصه پژوهش**:

The sensitivity to chirality of Raman optical activity (ROA), which we measure as a small difference in vibrational Raman scattering from chiral molecules in right- and left-circularly polarized incident light, makes it a powerful probe of the structure and behaviour of biomolecules in aqueous solution. Protein ROA spectra provide information on the secondary and tertiary structure of the polypeptide backbone and effects of the local environment, including hydration and the side chain conformations of particular residues. The large number of structure-sensitive bands in protein ROA spectra is especially favourable for fold determination using pattern recognition techniques. Intact viruses may also be studied and their ROA spectra provide information not only on the folds of the coat proteins but also about the conformation of the encapsidated nucleic acid. In this article we present the ROA spectra of several proteins and viruses in order to illustrate some of the applications of ROA spectroscopy in biomolecular research. © 2004 Elsevier B.V. All rights reserved.

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

10.1016/j.vibspec.2003.12.005

✓ **نام ژورنال**:

Vibrational Spectroscopy

✓ **سال انتشار**:

2004

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Erratum: Protein and DNA residue orientations in the filamentous virus Pfl determined by polarized Raman and polarized FTIR spectroscopy (Biochemistry (February 4, 2003) 42:4 (940-950))

✓ **نویسندگان**:

[No author name available]

✓ **خلاصه پژوهش**:

[No abstract available]

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

10.1021/bi033007c

✓ **نام ژورنال**:

Biochemistry

✓ **سال انتشار**:

2003

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Protein and DNA residue orientations in the filamentous virus Pf1 determined by polarized Raman and polarized FTIR spectroscopy

✓ نویسندگان:

Tsuboi M., Kubo Y., Ikeda T., Overman S.A., Osman O., Thomas Jr. G.J.

✓ خلاصه پژوهش:

The Pseudomonas bacteriophage Pf1 is a long (~2000 nm) and thin (~6.5 nm) filament consisting of a covalently closed, single-stranded DNA genome of 7349 nucleotides coated by 7350 copies of a 46-residue α-helical subunit. The coat subunits are arranged as a superhelix of C1S5.4 symmetry (class II). Polarized Raman and polarized FTIR spectroscopy of oriented Pf1 fibers show that the packaged single-stranded DNA genome is ordered specifically with respect to the capsid superhelix. Bases are nonrandomly arranged along the capsid interior, deoxynucleosides are uniformly in the C2′-endo/anti conformation, and the average DNA phosphodioxy group (PO2-) is oriented so that the line connecting the oxygen atoms (O···O) forms an angle of 71°4 ± 5° with the virion axis. Raman and infrared amide band polarizations show that the subunit α-helix axis is inclined at an average angle of 16° ± 4° with respect to the virion axis. The α-helical symmetry of the capsid subunit is remarkably rigorous, resulting in splitting of Raman-active helix vibrational modes at 351, 445 and 1026 cm-1 into apparent A-type and E2-type symmetry pairs. The subunit tyrosines (Tyr 25 and Tyr 40) are oriented with phenoxyl rings packed relatively close to parallel to the virion axis. The Tyr 25 and Tyr 40 orientations of Pf1 are surprisingly close to those observed for Tyr 21 and Tyr 24 of the Ff virion (C5S2 symmetry, class I), suggesting a preferred tyrosyl side chain conformation in packed α-helical subunits, irrespective of capsid symmetry. The polarized Raman spectra also provide information on the orientations of subunit alanine, valine, leucine and isoleucine side chains of the Pf1 virion.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/bi020566v

✓ نام ژورنال:

Biochemistry

✓ سال انتشار:

2003

✓ کلیدواژه (Keywords):

Detect Precisely

✓ **عنوان پژوهش**:

Vibrational Raman optical activity of proteins, nucleic acids, and viruses

✓ **نویسندگان**:

Blanch E.W., Hecht L., Barron L.D.

✓ **خلاصه پژوهش**:

Due to its sensitivity to chirality, Raman optical activity (ROA), which may be measured as a small difference in vibrational Raman scattering from chiral molecules in right- and left-circularly polarized incident light, is a powerful probe of biomolecular structure in solution. Protein ROA spectra provide information on the secondary and tertiary structures of the polypeptide backbone, hydration, side-chain conformation, and structural elements present in denatured states. Nucleic acid ROA spectra yield information on the sugar ring conformation, the base stacking arrangement, and the mutual orientation of the sugar and base rings around the C-N glycosidic linkage. ROA is able to simultaneously probe the structures of both the protein and the nucleic acid components of intact viruses. This article gives a brief account of the theory and measurement of ROA and presents the ROA spectra of a selection of proteins, nucleic acids, and viruses which illustrate the applications of ROA spectroscopy in biomolecular research. © 2003 Elsevier Science (USA). All rights reserved.

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

10.1016/S1046-2023(02)00310-9

✓ **نام ژورنال**:

Methods

✓ **سال انتشار**:

2003

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Structure and behaviour of proteins, nucleic acids and viruses from vibrational Raman optical activity

✓ **نویسندگان**:

Barron L.D., Blanch E.W., McColl I.H., Syme C.D., Hecht L., Nielsen K.

✓ **خلاصه پژوهش**:

On account of its sensitivity to chirality Raman optical activity (ROA), which may be measured as a small difference in vibrational Raman scattering from chiral molecules in right- and left-circularly polarized incident light, is a powerful probe of structure and behaviour of biomolecules in aqueous solution. Protein ROA spectra provide information on the secondary and tertiary structure of the polypeptide backbone, hydration, side chain conformation and structural elements present in denatured states. Nucleic acid ROA spectra provide information on the sugar ring conformation, the base stacking arrangement and the mutual orientation of the sugar and base rings around the C-N glycosidic link. The ROA spectra of intact viruses provide information on the folds of the coat proteins and the nucleic acid structure. The large number of structure-sensitive bands in protein ROA spectra is especially favourable for fold determination using pattern recognition techniques. This article gives a brief account of the ROA technique and presents the ROA spectra of a selection of proteins, nucleic acids and viruses that illustrate the applications of ROA spectroscopy in biomolecular research.

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

10.1155/2003/787940

✓ **نام ژورنال**:

Spectroscopy

✓ **سال انتشار**:

2003

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Surface-enhanced Raman spectroscopic study on the interaction of hepatitis B virus surface antigen and its monoclonal antibody

✓ **نویسندگان**:

Wang L.-Y., Ji X.-H., Yuan H., Ma L., Kong X.-G., Liu Y.-C., Yang W.-S., Bai Y.-B., Li T.-J.

✓ **خلاصه پژوهش**:

Surface-enhanced Raman scattering (SERS) has been employed to study the interaction of hepatitis B virus surface antigen (HBsAg) with mouse monoclonal antibody against HBsAg (Ab-HBsAg) . SERS is used to obtain spectra of HBsAg, Ab-HBsAg and their immune complex adsorbed on colloidal silver. It is found that Ab-HBsAg is bound to silver colloids through the carboxyl groups, which are not on the antigen binding site of the Ab-HBsAg. The vibrations from tryptophan residues of the HBsAg disappear after formation of the immune complex. It is assumed that the tryptophan residues are among the antigen active sites of the HBsAg and play an important role in the interaction between Ab-HBsAg and HBsAg.

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

✓ **نام ژورنال**:

Acta Chimica Sinica

✓ **سال انتشار**:

2002

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Characterization of subunit-specific interactions in a double-stranded RNA virus: Raman difference spectroscopy of the ϕ6 procapsid

✓ **نویسندگان**:

Benevides J.M., Juuti J.T., Tuma R., Bamford D.H., Thomas Jr. G.J.

✓ **خلاصه پژوهش**:

The icosahedral core of a double-stranded (ds) RNA virus hosts RNA-dependent polymerase activity and provides the molecular machinery for RNA packaging. The stringent requirements of dsRNA metabolism may explain the similarities observed in core architecture among a broad spectrum of dsRNA viruses, from the mammalian rotaviruses to the Pseudomonas bacteriophage ϕ6. Although the structure of the assembled core has been described in atomic detail for Reoviridae (blue tongue virus and reovirus), the molecular mechanism of assembly has not been characterized in terms of conformational changes and key interactions of protein constituents. In the present study, we address such questions through the application of Raman spectroscopy to an in vitro core assembly system - the procapsid of ϕ6. The ϕ6 procapsid, which comprises multiple copies of viral proteins P1 (copy number 120), P2 (12), P4 (72), and P7 (60), represents a precursor of the core that is devoid of RNA. Raman signatures of the procapsid, its purified recombinant core protein components, and purified sub-assemblies lacking either one or two of the protein components have been obtained and interpreted. The major procapsid protein (P1), which forms the skeletal frame of the core, is an elongated and monomeric molecule of high α-helical content. The fold of the core RNA polymerase (P2) is also mostly α-helical. On the other hand, the folds of both the procapsid accessory protein (P7) and RNA-packaging ATPase (P4) are of the α/β type. Raman difference spectra show that conformational changes occur upon interaction of P1 with either P4 or P7 in the procapsid. These changes involve substantial ordering of the polypeptide backbone. Conversely, conformations of procapsid subunits are not significantly affected by interactions with P2. An assembly model is proposed in which P1 induces α-helix in P4 during formation of the nucleation complex. Subsequently, the partially disordered P7 subunit is folded within the context of the procapsid shell.

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

10.1021/bi0201623

Detect Precisely

✓ **نام ژورنال**:

Biochemistry

✓ **سال انتشار**:

2002

✓ **کلیدواژه** (Keywords):

✓ **عنوان پژوهش**:

Molecular structures of viruses from Raman optical activity

✓ **نویسندگان**:

Blanch E.W., Hecht L., Syme C.D., Volpetti V., Lomonossoff G.P., Nielsen K., Barron L.D.

✓ **خلاصه پژوهش**:

A vibrational Raman optical activity (ROA) study of a range of different structural types of virus exemplified by filamentous bacteriophage fd, tobacco mosaic virus, satellite tobacco mosaic virus, bacteriophage MS2 and cowpea mosaic virus has revealed that, on account of its sensitivity to chirality, ROA is an incisive probe of their aqueous solution structures at the molecular level. Protein ROA bands are especially prominent from which, as we have shown by comparison with the ROA spectra of proteins with known structures and by using a pattern recognition program, the folds of the major coat protein subunits may be deduced. Information about amino acid side-chain conformations, exemplified here by the determination of the sign and magnitude of the torsion angle χ2,1 for tryptophan in fd, may also sometimes be obtained. By subtracting the ROA spectrum of the empty protein capsid (top component) of cowpea mosaic virus from those of the intact middle and bottom-upper components separated by means of a caesium chloride density gradient, the ROA spectrum of the viral RNA was obtained, which revealed that the RNA takes up an A-type single-stranded helical conformation and that the RNA conformations in the middle and bottom- upper components are very similar. This information is not available from the X-ray crystal structure of cowpea mosaic virus since no nucleic acid is visible.

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

10.1099/0022-1317-83-10-2593

✓ **نام ژورنال**:

Journal of General Virology

✓ **سال انتشار**:

2002

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

New insight into solution structure and dynamics of proteins, nucleic acids, and viruses from Raman optical activity

✓ **نویسندگان**:

Barron L.D., Blanch E.W., Bell A.F., Syme C.D., Hecht L., Day L.A.

✓ **خلاصه پژوهش**:

Raman optical activity measures vibrational optical activity by means of a small difference in the intensity of Raman scattering from chiral molecules in right and left circularly polarized incident light. The sensitivity of ROA to chirality makes it an incisive probe of biomolecular structure and dynamics in aqueous solution. This article reviews the basic theory and instrumentation of ROA, and describes recent results which illustrate how ROA provides new insight into current biomedical problems including protein misfolding and disease, and virus structure at the molecular level.

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

10.1021/bk-2002-0810.ch003

✓ **نام ژورنال**:

ACS Symposium Series

✓ **سال انتشار**:

2002

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Solution structures of potato virus X and narcissus mosaic virus from Raman optical activity

✓ **نویسندگان**:

Blanch E.W., Robinson D.J., Hecht L., Syme C.D., Nielsen K., Barron L.D.

✓ **خلاصه پژوهش**:

Potato virus X (PVX) and narcissus mosaic virus (NMV) were studied using vibrational Raman optical activity (ROA) in order to obtain new information on the structures of their coat protein subunits. The ROA spectra of the two intact virions are very similar to each other and similar to that of tobacco mosaic virus (TMV) studied previously, being dominated by signals characteristic of proteins with helix bundle folds. In particular, PVX and NMV show strong positive ROA bands at ~ 1340 cm-1 assigned to hydrated α-helix and perhaps originating in surface exposed helical residues, together with less strong positive ROA intensity in the range ~ 1297-1312 cm-1 assigned to α-helix in a more hydrophobic environment and perhaps originating in residues at helix-helix interfaces. The positive ~ 1340 cm-1 ROA band of TMV is less intense than those of PVX and NMV, suggesting that TMV contains less hydrated α-helix. Small differences in other spectral regions reflect differences in some loop, turn and side-chain compositions and conformations among the three viruses. A pattern recognition program based on principal component analysis of ROA spectra indicates that the coat protein subunit folds of PVX and NMV may be very similar to each other and similar to that of TMV. These results suggest that PVX and NMV may have coat protein subunit structures based on folds similar to the TMV helix bundle and hence that the helical architecture of the PVX and NMV particles may be similar to that of TMV but with different structural parameters.

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

10.1099/0022-1317-83-1-241

✓ **نام ژورنال**:

Journal of General Virology

✓ **سال انتشار**:

2002

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Tyrosine raman signatures of the filamentous virus Ff are diagnostic of non-hydrogen-bonded phenoxyls: Demonstration by raman and infrared spectroscopy of p-cresol vapor

✓ نویسندگان:

Arp Z., Autrey D., Laane J., Overman S.A., Thomas Jr. G.J.

✓ خلاصه پژوهش:

p-Cresol is a simple molecular model for the para phenolic side chain of tyrosine. Previously, Siamwiza and co-workers [(1975) Biochemistry 14, 4870-4876] investigated p-cresol solutions to identify Raman spectroscopic signatures for different hydrogen-bonding states of the tyrosine phenoxyl group in proteins. They found that the phenolic moiety exhibits an intense Raman doublet in the spectral interval 820-860 cm-1 and that the doublet intensity ratio (I2/I1, where I2 and I1 are Raman peak intensities of the higher- and lower-wavenumber members of the doublet) is diagnostic of specific donor and acceptor roles of the phenoxyl OH group. The range of the doublet intensity ratio in proteins (0.30 < I2/I1 < 2.5) was shown to be governed by Fermi coupling between the phenolic ring-stretching fundamental v1 and the first overtone of the phenolic ring-deformation mode v16a, such that when the tyrosine phenoxyl proton is a strong hydrogen-bond donor, I2/I1 = 0.30, and when the tyrosine phenoxyl oxygen is a strong hydrogen-bond acceptor, I2/I1 = 2.5. Here, we interpret the Raman and infrared spectra of p-cresol vapor and extend the previous correlation to the non-hydrogen-bonded state of the tyrosine phenoxyl group. In the absence of hydrogen bonding, the Raman intensity of the higher-wavenumber component of the canonical Fermi doublet is greatly enhanced such that I2/I1 = 6.7. Thus, for the non-hydrogen-bonded phenoxyl, the lower-wavenumber member of the Fermi doublet loses most of its Raman intensity. This finding provides a basis for understanding the anomalous Raman singlet signature (~854 cm-1) observed for tyrosine in coat protein subunits of filamentous viruses Ff and Pf1 [Overman, S. A., et al. (1994) Biochemistry 33, 1037-1042; Wen, Z. Q., et al. (1999) Biochemistry 38, 3148-3156]. The implications of the present results for Raman analysis of tyrosine hydrogen-bonding states in other proteins are considered.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/bi0023753

✓ نام ژورنال:

Biochemistry

✓ سال انتشار:

2001

✓ کلیدواژه (Keywords):

Detect Precisely

✓ عنوان پژوهش:

Orientations of Tyr 21 and Tyr 24 in the capsid of filamentous virus Ff determined by polarized Raman spectroscopy

✓ نویسندگان:

Tsuboi M., Ushizawa K., Nakamura K., Benevides J.M., Overman S.A., Thomas Jr. G.J.

✓ خلاصه پژوهش:

The capsid of filamentous virus Ff is assembled from ~2750 copies of a 50-residue α-helical subunit, the two tyrosines of which (Tyr 21 and Tyr 24) are located within a hydrophobic sequence that constitutes the subunit interface. We have determined the side chain orientations of Tyr 21 and Tyr 24 by polarized Raman microspectroscopy of oriented Ff fibers, utilizing a novel experimental approach that combines site-specific mutation and residue-specific deuteration of capsid subunits. The polarized Raman signature of Tyr 21 was obtained by incorporating Cαδ1,Cαδ2,Cϵ1, Cϵ2-tetradeuteriotyrosine at position 21 in an Ff mutant in which Tyr 24 is replaced with methionine. Similarly, the polarized Raman signature of Tyr 24 was obtained by incorporating Cαδ1,Cδ2,Cϵ1, Cϵ2-tetradeuteriotyrosine at position 24 in the analogous Tyr 21 → Met mutant. Polarizations of the corresponding C-D stretching bands in the 2200-2400 cm-1 interval of the Raman spectrum were measured and interpreted using tensors transferred from a polarized Raman analysis of L-tyrosine-2,3,5,6-d4 single crystals. Polarized Raman analysis was extended to the bands of Ff near 642 and 855 cm-1, which originate from vibrational modes of the tyrosine phenolic ring. The results indicate the following: (i) For both Tyr 21 and Tyr 24, the phenolic 2-fold axis (C1-C4 line) is inclined at 41 ± 5° from the virion axis and the normal to the plane of the phenolic ring is inclined at 71 ± 5° from the virion axis; (ii) the mutation of Tyr 24, but not the mutation of Tyr 21, perturbs Raman markers of the subunit tryptophan (Trp 26), suggesting interdependence of Tyr 24 and Trp 26 orientations in native Ff; and (iii) polarization anisotropies observed for Raman markers of Ff DNA bases are unperturbed by mutation of either Tyr 21 or Tyr 24, indicating that nonrandom base orientations of packaged Ff DNA are independent of the mutation of either Tyr 21 or Tyr 24. A molecular model consistent with these findings is proposed.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/bi001936n

✓ نام ژورنال:

Biochemistry

✓ سال انتشار:

2001

✓ کلیدواژه (Keywords):

Detect Precisely

✓ **عنوان پژوهش**:

Surface-enhanced Raman spectroscopy of insect nuclear polyhedrosis virus

✓ **نویسندگان**:

Bao P.-D., Huang T.-Q., Liu X.-M., Wu T.-Q.

✓ **خلاصه پژوهش**:

The surface-enhanced Raman scattering (SERS) spectra of polydrin of Trabala vishnou nuclear polyhedrosis virus (sample 1) and polydrin of Dendrolimus punctatus nuclear polyhedrosis virus (sample 2) adsorbed in silver hydrosol were investigated. The features in the adsorption mode, enhancement character and mechanism of the SERS spectra of these two samples were compared and are discussed. It was found that the molecules of sample 1 adsorbed on the silver surface through carboxyl and amino groups, and the molecules of sample 2 through the sulfur atom and also carboxyl and amino groups. The chemisorption of the molecules of both samples and their short-range character indicate that the molecular mechanism is the primary enhancement in the SERS spectra of molecules of these two insect viruses. Copyright © 2001 John Wiley & Sons, Ltd.

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

10.1002/jrs.665

✓ **نام ژورنال**:

Journal of Raman Spectroscopy

✓ **سال انتشار**:

2001

✓ **کلیدواژه** (Keywords):

TEKSAN
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✓ عنوان پژوهش:

A comparison of the solution structures of tobacco rattle and tobacco mosaic viruses from Raman optical activity

✓ نویسندگان:

Blanch E.W., Robinson D.J., Hecht L., Barron L.D.

✓ خلاصه پژوهش:

Vibrational Raman optical activity (ROA) spectra of tobacco rattle virus (TRV) and tobacco mosaic virus (TMV) were measured and compared with a view to obtaining new information about the coat protein subunit structure of TRV. A sharp strong positive band observed at ~1 1344 cm-1 in the ROA spectra of the two viruses is evidence that both contain a significant amount of a hydrated form of α-helix, but more in TRV than in TMV. Although the ROA spectrum of TMV shows significant positive intensity in the range ~1 1297-1312 cm-1 characteristic of α-helix in a hydrophobic environment, as expected from the helix interface residues in the four-helix bundles that constitute the basic motif of the TMV coat protein fold, that of TRV shows little positive ROA intensity here. Instead TRV shows a strong positive ROA band at ~1 1315 cm-1, of much greater intensity than bands shown here by TMV, that is characteristic of polyproline II (PPII) helix. This suggests that the additional of PPII structure, plus perhaps some β-strand judging by a prominent sharp negative ROA band shown by TRV at ~1 1236 cm-1, but little α-helix. The open flexible hydrated nature of PPII helical structure is consistent with the earlier suggestions that the additional sequences are exposed and, together with a larger amount of hydrated α-helix, could serve to fill the extra volume required by the larger diameter of the cylindrical TRV particles relative to those of TMV.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1099/0022-1317-82-6-1499

✓ نام ژورنال:

Journal of General Virology

✓ سال انتشار:

2001

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Erratum: Ultraviolet-resonance Raman spectroscopy of the filamentous virus Pf3: Interactions of Trp 38 specific to the assembled virion subunit (Biochemistry (January 11, 2000) 39:1 (146-152))

✓ **نویسندگان**:

[No author name available]

✓ **خلاصه پژوهش**:

[No abstract available]

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

10.1021/bi0051041

✓ **نام ژورنال**:

Biochemistry

✓ **سال انتشار**:

2000

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Intensity of the polarized Raman band at 1340-1345 cm-1 as an indicator of protein α-helix orientation: Application to Pf1 filamentous virus

✓ **نویسندگان**:

Tsuboi M., Suzuki M., Overman S.A., Thomas Jr. G.J.

✓ **خلاصه پژوهش**:

Raman spectra of oriented α-helical protein molecules exhibit a prominent band near 13401345 cm-1, the intensity of which is highly sensitive to molecular orientation. Polarization of the 13401345 cm-1 marker is evident in Raman spectra of α-helical poly-L-alanine (αPLA) and α-helical polyγ-benzyl-L-glutamate (αPBLG). Corresponding polarization is also observed in Raman spectra of the filamentous virus Pf1, which is an assembly of α-helical coat protein molecules. In αPLA and αPBLG, we assign the band to a normal mode of symmetry type E2 and specifically to a vibration localized in the (O=C)CαH linkages of the main chain peptide group. Although strict helical symmetry does not apply to coat subunits of filamentous viruses, an approximate E2-type mode may be presumed to account for a corresponding Raman band of Pf1 and fd filamentous viruses. Spectroscopic studies of N-methylacetamide and isotopically-edited fd viruses support the present assignment of the 1340-1345 cm-1 band. Polarization anisotropy indicates that this band may be exploited as a novel indicator of protein α-helix orientation. Application of this approach to the polarized Raman spectrum of Pf1 suggests that, on average, the axis of the α-helical coat protein subunit in the native virion structure forms an angle of 20 ± 10° with respect to the virion axis.

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

10.1021/bi9918846

✓ **نام ژورنال**:

Biochemistry

✓ **سال انتشار**:

2000

✓ **کلیدواژه** (Keywords):

✓ عنوان پژوهش:

Ultraviolet-resonance Raman spectroscopy of the filamentous virus Pf3: Interactions of Trp 38 specific to the assembled virion subunit

✓ نویسندگان:

Wen Z.Q., Thomas Jr. G.J.

✓ خلاصه پژوهش:

The class II filamentous virus Pf3 packages a circular single-stranded DNA genome of ~6300 nucleotides within a cylindrical capsid constructed from ~2630 copies of a 44 residue α-helical subunit. The single tryptophan residue (Trp 38) of the capsid subunit is located within a basic C-terminal sequence (...R+WIK+AQFF). The local environment of Trp 38 in the native Pf3 assembly has been investigated using 229 nm excited ultraviolet-resonance Raman (UVRR) spectroscopy and fluorescence spectroscopy. Trp 38 exhibits an anomalous UVRR signature in Pf3, including structure-diagnostic Raman bands (763, 1228, 1370, and 1773 cm-1) that are greatly displaced from corresponding Raman markers observed in either detergent-disassembled Pf3, class I filamentous viruses, most globular proteins, or aqueous L-Trp. An unusual and highly quenched fluorescence spectrum is also observed for Trp 38. These distinctive UVRR and fluorescence signatures together reflect interactions of the Trp 38 side chain that are specific to the native Pf3 assembly. The experimental results on Pf3 and supporting spectroscopic data from other proteins of known three-dimensional structure favor a model in which π electrons of the Trp 38 indolyl ring interact specifically with a basic side chain of the subunit C-terminal sequence. Residues Arg 37 and Lys 40 are plausible candidates for the proposed cation-π interaction of Trp 38. The present study suggests that Raman spectroscopy may be a generally useful probe of interactions between the indolyl π-electron system of tryptophan and electropositive groups in proteins and their assemblies.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/bi992018w

✓ نام ژورنال:

Biochemistry

✓ سال انتشار:

2000

✓ کلیدواژه (Keywords):

✓ **عنوان پژوهش**:

Application of surface-enhanced Raman scattering spectroscopy to the study of insect virus virion

✓ **نویسندگان**:

Bao PeiDi, Liu XinMing, Huang TianQuan, Jiang Bing, Wu GuoFeng

✓ **خلاصه پژوهش**:

The Surface-Enhanced Raman Scattering (SERS) spectra of the virions of four kinds of insect virus: Nuclear polyhedrosis virus of Trabala Vishnou (TvNPV), Nuclear polyhedrosis virus of Gynaephora ruoergensis (GrNPV), Granulosis Virus of preris rapae (PrGV) and Granulosis Virus of Darna trima (DtGV) adsorbed on the surface of silver colloid particles have been obtained and investigated. The strong interactions appeared between silver surface and COO- groups, NH2 groups or aromatic side-chains in SERS of the molecules of the virions. The intensities of bands related to the vibrations of COO- groups are 458-460cm-1: v (COO-), 568-577cm-1: w(COO-), 614-624cm-1: δ (COO-), 914-934cm-1: v (C-COO-) and the bands related to the vibrations of NH2 groups are 1114-1134cm-1: t(NH2), 1620-1632cm-1: δ (NH2), 3390-3398cm-1: v (NH2). It indicates that the molecules of the virions adsorbed on silver through both the COO- and NH2 groups. The short-range enhancement results from a chemical interaction between the virion molecules and the silver surface. The bands at low frequency (218-236 cm-1) in the SERS spectra of the four samples show that chemiscorption is a main mechanism on silver hydrosis of the virion. The π - electron systems of side-chains of the aromatic amino acids in virion have formed the additional adsorption centers in the molecules of virions, it will decrease the distance between some groups of molecules and the silver surface. So the bands at 928, 914, 930, 934 cm-1, due to the skeletal C-C vibration, have been enhanced.

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

✓ **نام ژورنال**:

Proceedings of SPIE - The International Society for Optical Engineering

✓ **سال انتشار**:

1999

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Demonstration by ultraviolet resonance raman spectroscopy of differences in DNA organization and interactions in filamentous viruses Pf1 and fd

✓ نویسندگان:

Wen Z.Q., Armstrong A., Thomas Jr. G.J.

✓ خلاصه پژوهش:

Pf1, a class II filamentous virus, has been investigated by ultraviolet resonance Raman (UVRR) spectroscopy with excitation wavelengths of 257, 244, 238, and 229 nm. The 257-nm UVRR spectrum is rich in Raman bands of the packaged single-stranded DNA (ssDNA) genome, despite the low DNA mass (6%) of the virion. Conversely, the 229-nm UVRR spectrum is dominated by tyrosines (Tyr 25 and Tyr 40) of the 46-residue α-helical coat subunit. UVRR spectra excited at 244 and 238 nm exhibit Raman bands diagnostic of both viral DNA and coat protein tyrosines. Raman markers of packaged Pf1 DNA contrast sharply with those of the DNA packaged in the class I filamentous virus fd [Wen, Z. Q., Overman, S. A., and Thomas, G. J., Jr. (1997) Biochemistry 36, 7810-7820]. Interestingly, deoxynucleotides of Pf1 DNA exhibit sugars in the C2'-endo/anti conformation and bases that are largely unstacked, compared with C3'-endo/anti conformers and very strong base stacking in fd DNA; hydrogen-bonding interactions of thymine carbonyls are also different in Pf1 and fd. On the other hand, coat protein tyrosines of Pf1 exhibit Raman markers of ring environment identical to those of fd, including an anomalous singlet at 853 cm-1 in lieu of the canonical Fermi doublet (850/830 cm- 1) found in globular proteins. The results indicate markedly different modes of organization of ssDNA in Pf1 and fd virions, despite similar environments for coat protein tyrosines, and suggest strong hydrogen-bonding interactions between DNA bases and coat subunits of Pf1 but not between those of fd. We propose that structural relationships between the protein coat and encapsidated ssDNA genome are also fundamentally different in the two assemblies.Pf1, a class II filamentous virus, has been investigated by ultraviolet resonance Raman (UVRR) spectroscopy with excitation wavelengths of 257, 244, 238, and 229 nm. The 257-nm UVRR spectrum is rich in Raman bands of the packaged single-stranded DNA (ssDNA) genome, despite the low DNA mass (6%) of the virion. Conversely, the 229-nm UVRR spectrum is dominated by tyrosines (Tyr 25 and Tyr 40) of the 46-residue α-helical coat subunit. UVRR spectra excited at 244 and 238 nm exhibit Raman bands diagnostic of both viral DNA and coat protein tyrosines. Raman markers of packaged Pf1 DNA contrast sharply with those of the DNA packaged in the class I filamentous virus fd [Wen, Z. Q., Overman, S. A., and Thomas, G. J., Jr. (1997) Biochemistry 36, 7810-7820]. Interestingly, deoxynucleotides of Pf1 DNA exhibit sugars in the C2′-endo/anti conformation and bases that are largely unstacked, compared with C3′-endo/anti conformers and very strong base stacking in fd DNA; hydrogen-bonding interactions of thymine carbonyls are also different in Pf1 and fd. On the other hand, coat protein tyrosines of Pf1 exhibit Raman markers of ring environment identical to those of fd, including an anomalous singlet at 853 cm-1 in lieu of the canonical Fermi doublet (850/830 cm-1) found in globular proteins. The results indicate markedly different modes of organization of ssDNA in Pf1 and fd virions, despite similar environments for coat protein tyrosines, and suggest strong hydrogen-bonding interactions between DNA bases and coat subunits of Pf1 but not between those of fd. We propose that structural relationships between the protein coat and encapsidated ssDNA genome are also fundamentally different in the two assemblies.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/bi981965m

✓ نام ژورنال:

Biochemistry

✓ سال انتشار:

1999

✓ کلیدواژه (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Studies of bovine enterovirus structure by ultraviolet resonance Raman spectroscopy

✓ **نویسندگان**:

Kaminaka S., Imamura Y., Shingu M., Kitagawa T., Toyoda T.

✓ **خلاصه پژوهش**:

The structural comparison of bovine enterovirus MZ468 strain before and after the heat treatment was studied by ultraviolet resonance Raman (UVRR) spectra excited at both 235 and 251 nm. The difference between full, heated full and purified empty particles, which were expected as an in vitro model of uncoating, were demonstrated. At 235 nm excitation, the Raman bands of the capsid protein dominated in all the UVRR spectra. The UVRR spectra of the empty particles exhibited non-homogenious broadening for tryptophan W3 band and W7 Fermi doublet bands, which were characteristics of hydrophobic environment, when compared with those of the full particles. The results indicates that some Trp indole rings of the full particles were packaged inside the viral capsids and not strained by virion assembly. On the other hand, the Raman bands assigned to guanine residues of the single stranded-RNA genome were enhanced strongly in the 251-nm excited UVRR spectrum. The spectral differences between the packaged (full particles) and the unpackaged virions (heated full particles) indicates that some guanine residues had strong hydrogen bonds in the full particles. Copyright (C) 1999 Elsevier Science B.V.

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

10.1016/S0166-0934(98)00153-0

✓ **نام ژورنال**:

Journal of Virological Methods

✓ **سال انتشار**:

1999

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Raman scattering spectra of insect virus PrGV-VP and their surface-enhanced Raman scattering spectra adsorbed on silver

✓ **نویسندگان**:

Bao P., Huang T., Liu X., Wu T.

✓ **خلاصه پژوهش**:

The ordinary Raman scattering (ORS) spectra of virion protein of Granulosis Virus of Cabbage Batterfly Preris rapae (PrGV-VP) and their surface-enhanced Raman scattering (SERS) spectra adsorbed on the surface of silver colloid particales have been obtained and analysed. The SERS spectra and the ORS spectra of PrGV-VP show their correlations. It was found that the Raman signal in the SERS spectra was enhanced by a factor of about 8 × 102. In ORS spectra of PrGV-VP, it indicates that PrGV-VP has a predominantly random-coil secondary structures. All tyrosine residues are exposed. And the PrGV-VP has a gauche-gauche-gauche configuration of the C-C-S-S-C-C linkage. In SERS spectra of PrGV-VP, the intensities of bands related to COO- group and NH2 group vibrations are relatively strong. We interpret that the PrGV-VP are adsorbed on the Ag surface through both the carboxylate groups and the amino groups. The efficient enhancement of amide I and amide III vibrations are impeded, because the peptide groups of PrGV-VP are screened by the side-chains amino acide residues. The Raman enhancement of PrGV-VP has a short-range mechanism. The chemisorption is a main mechanism on Ag hydrosols of PrGV-VP.

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

10.1117/12.305384

✓ **نام ژورنال**:

Proceedings of SPIE - The International Society for Optical Engineering

✓ **سال انتشار**:

1998

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Amide modes of the α-helix: Raman spectroscopy of filamentous virus fd containing peptide 13C and 2H labels in coat protein subunits

✓ **نویسندگان**:

Overman S.A., Thomas Jr. G.J.

✓ **خلاصه پژوهش**:

The filamentous virus fd consists of a single-stranded DNA genome sheathed by 2700 copies of a 50-residue α-helical subunit (protein pVIII) and serves as a model assembly of α-helices. To advance vibrational assignments for the α-helix, we have investigated Raman spectra of fd virions containing 13C and 2H (deuterium) labels at various main-chain sites of the pVIII subunits. 13C was introduced at specific peptide carbonyls, while deuterium was introduced at selected α-carbon (C(α)) and amide nitrogen positions. Interpretation of the Raman spectra reveals a previously unrecognized α-helix band in the spectral interval 730-745 cm- 1, tentatively assigned to a carbonyl in-plane bending mode (amide IV). Experimental evidence has also been obtained for a distinctive α-helix marker near 1345 cm-1, assigned to a coupled C(α)-H bending and C(α)-C stretching mode. The fd virions containing 13C-labeled carbonyls exhibit unexpectedly complex amide I profiles, consisting of multiple band components. Amide I splitting resulting from 13C substitution of carbonyls is attributed to decoupling of transition-dipole interactions normally occurring in the extended pVIII helix. The present study identifies novel conformation-dependent Raman bands in a native α-helix assembly, confirms amide I and amide III assignments proposed previously for filamentous viruses, and facilitates new Raman assignments for the packaged ssDNA. The α-helix markers identified here should also be useful in conformation analyses of other proteins by Raman spectroscopy.

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

10.1021/bi972339c

✓ **نام ژورنال**:

Biochemistry

✓ **سال انتشار**:

1998

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Resonance Raman characterization of soluble guanylate cyclase expressed from baculovirus

✓ **نویسندگان**:

Fan B., Gupta G., Danziger R.S., Friedman J.M., Rousseau D.L.

✓ **خلاصه پژوهش**:

Resonance Raman spectra of the α1β1 isoform of bovine lung soluble guanylate cyclase expressed from baculovirus have been measured. The spectra show that the ferric heme is five-coordinate high spin whereas the ferrous heme in the absence of added exogenous ligands is a mixture of six-coordinate low spin and five-coordinate high spin. In the Fe-CO-derivative, the correlation between the Fe-CO frequency (497 cm-1) and the C-O frequency (1959 cm-1) demonstrates that the proximal ligand in our preparation is histidine. The Fe-NO stretching frequency (found at 520 cm-1) and other spectral features of the ferrous Fe-NO-bound sGC are similar to those reported by Deinum et al. (1) and Yu et al. (2). These data indicate that although large preparation-dependent differences in the occupancy of the distal pocket exist, all the preparations have the same proximal histidine ligation and share the same mechanism of activation by NO.

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

10.1021/bi971934b

✓ **نام ژورنال**:

Biochemistry

✓ **سال انتشار**:

1998

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

UV resonance raman spectroscopy of DNA and protein constituents of viruses: Assignments and cross sections for excitations at 257, 244, 238, and 229 nm

✓ **نویسندگان**:

Wen Z.Q., Thomas Jr. G.J.

✓ **خلاصه پژوهش**:

Ultraviolet resonance Raman (UVRR) spectra of H2O and D2O solutions of the nucleoside (dA, dG, dC, dT) and aromatic amino acid (Phe, Trp, Tyr) constituents of DNA viruses have been obtained with laser excitation wavelengths of 257, 244, 238, and 229 nm. Using the 981 cm-1 marker of Na2SO4 as an internal standard, Raman frequencies and scattering cross sections were evaluated for all prominent UVRR bands at each excitation wavelength. The results show that UVRR cross sections of both the nucleosides and amino acids are strongly dependent on excitation wavelength and constitute sensitive and selective probes of the residues. The results provide a library of UVRR marker bands for structural analysis of DNA viruses and other nucleoprotein assemblies. © 1998 John Wiley & Sons, Inc.

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

10.1002/(sici)1097-0282(199803)45:3<247::aid-bip7>3.0.co;2-r

✓ **نام ژورنال**:

Biopolymers

✓ **سال انتشار**:

1998

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Orientations of tyrosines 21 and 24 in coat subunits of Ff filamentous virus: Determination by Raman linear intensity difference spectroscopy and implications for subunit packing

✓ نویسندگان:

Matsuno M., Takeuchi H., Overman S.A., Thomas Jr. G.J.

✓ خلاصه پژوهش:

Virions of the Ff group of bacteriophages (fd, f1, M13) are morphologically identical filaments {~6-nm diameter x ~880-nm length) in which a covalently closed, single-stranded DNA genome is sheathed by ~2700 copies of a 50-residue α-helical subunit (pVIII). Orientations of pVIII tyrosines (Tyr21 and Tyr24) with respect to the filament axis have been determined by Raman linear intensity difference (RLID) spectroscopy of flow- oriented mutant virions in which the tyrosines were independently mutated to methionine. The results show that the twofold axis of the phenolic ring (C1- C4 line) of Tyr21 is inclined at 39.5 ± 1.4°from the virion axis, and that of Tyr24 is inclined at 43.7 ± 0.6°. The orientation determined for the Tyr21 phenol ring is close to that of a structural model previously proposed on the basis of fiber x-ray diffraction results (Protein Data Bank, identification code 1IFJ). On the other hand, the orientation determined for the Tyr24 phenol ring differs from the diffraction-based model by a 40°rotation about the Cα-Cβ bond. The RLID results also indicate that each tyrosine mutation does not greatly affect the orientation of either the remaining tyrosine or single tryptophan (Trp26) of pVIII. On the basis of these results, a refined model is proposed for the coat protein structure in Ff.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/S0006-3495(98)78028-2

✓ نام ژورنال:

Biophysical Journal

✓ سال انتشار:

1998

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Novel Vibrational Assignments for Proteins from Raman Spectra of Viruses

✓ **نویسندگان**:

Overman S.A., Thomas Jr. G.J.

✓ **خلاصه پژوهش**:

Raman spectroscopy and ultraviolet resonance Raman spectroscopy are versatile methods for probing details of protein structure and dynamics in complex biological assemblies, including viruses. The information contained in the Raman spectrum of a virus is ordinarily interpreted on the basis of an understanding that has been developed from detailed spectroscopic investigations of simpler and better characterized molecular structures, such as small globular proteins, peptides and related model compounds and their isotopic derivatives. The model systems approach serves generally as the foundation for reliable band assignments and has been the key to successful application of Raman methods to supramolecular assemblies. However, the converse approach is also possible. The supramolecular assembly may serve as a 'model compound' and its Raman signature may provide novel spectra-structure correlations applicable to isolated protein subunits, simpler proteins or related small molecules. Thus, the Raman spectrum of a virus particle can yield new insights into protein vibrational assignments. Here, a number of new vibrational assignments that have emerged from Raman studies of filamentous viruses are identified. The Raman bands in question have not been identified previously in proteins and are demonstrated to originate either from vibrations of the protein main-chain (CαH marker, 1340-1350 cm-1) or from aromatic amino acid side chains (phenylalanine marker, 827 cm-1; tyrosine singlet, 850-855 cm-1; tryptophan marker, 1560 cm-1). The present results, which are considered in the light of existing correlations between data on Raman spectra and protein structure, suggest that much remains to be learned about the structural significance of protein Raman bands. © 1998 John Wiley & Sons, Ltd.

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

10.1002/(sici)1097-4555(199801)29:1<23::aid-jrs213>3.3.co;2-b

✓ **نام ژورنال**:

Journal of Raman Spectroscopy

✓ **سال انتشار**:

1998

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Mechanisms of virus assembly probed by Raman spectroscopy: The icosahedral bacteriophage P22

✓ **نویسندگان**:

Tuma R., Thomas Jr. G.J.

✓ **خلاصه پژوهش**:

A microdialysis flow cell has been developed for time-resolved Raman spectroscopy of biological macromolecules and their assemblies. The flow cell permits collection of Raman spectra concurrent with the efflux of small solute molecules into a solution of macromolecules and facilitates real-time spectroscopic detection of structural transitions induced by the effluent. Additionally, the flow cell is well suited to the investigation of hydrogen- isotope exchange phenomena that can be exploited as dynamic probes of vital protein folding and solvent accessibility along the assembly pathway. Here, we describe the application of the Raman dynamic probe to the maturation of the icosahedral capsid of bacteriophage P22, a double-stranded DNA virus. The P22 virion is constructed from a capsid precursor (procapsid) consisting of 420 coat subunits (gp5) in an outer shell and a few hundred scaffolding subunits (gp8) within. Capsid maturation involves expulsion of scaffolding subunits coupled with shell expansion at the time of DNA packaging. Raman static and dynamic probes reveal that the scaffolding subunit is highly a- helical and highly thermolabile, and lacks a typical hydrophobic core. When bound within the procapsid, the α-helical fold of gp8 is thermostabilized; however, this stabilization confers no apparent protection against peptide NH → ND exchange. A molten globule model is proposed for the native scaffolding subunit that functions in procapsid assembly. Accompanying capsid expansion, a small conformational change (α-helix → β-strand) is also observed in the coat subunit. Domain movement mediated by hinge bending is proposed as the mechanism of capsid expansion. On the basis of these results, a molecular model is proposed for assembly of the P22 procapsid.

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

10.1016/S0301-4622(97)00001-X

✓ **نام ژورنال**:

Biophysical Chemistry

✓ **سال انتشار**:

1997

✓ **کلیدواژه** (Keywords):

Detect Precisely

✓ **عنوان پژوهش**:

Structure and interactions of the single-stranded DNA genome of filamentous virus fd: Investigation by ultraviolet resonance Raman spectroscopy

✓ **نویسندگان**:

Wen Z.Q., Overman S.A., Thomas Jr. G.J.

✓ **خلاصه پژوهش**:

The filamentous bacteriophage fd is a member of the Ff class of Inovirus, which includes phages fl and M13. Ultraviolet resonance Raman (UVRR) spectra fd have been obtained using excitation wavelengths of 257, 244, 238, and 229 nm. Excitation at 257 nm selectively enhances Raman markers of the packaged single-stranded (ss) DNA genome, while excitation at the shorter wavelengths favors the detection of Raman signals from coat protein aromatics, particularly tryptophan (W26) and tyrosine residues (Y21 and Y24) of the viral coat subunit (pVIII). The principal findings are the following: (1) Distinctive markers of dA, dC, dG, and dT residues of the packaged genome are identified in UVRR spectra of fd excited at 257 and 244 nm, despite the low DNA mass composition (12%) of the virion. (2) Raman bands of the bases of packaged ssDNA show extraordinary resonance Raman hypochromism. Raman intensity losses as large as 80% of the parent DNA nucleotide intensities are observed. This is interpreted as evidence of extensive short-range interactions involving bases of the packaged genome. (3) Conversely, Raman bands of tryptophan and tyrosine residues of the coat protein generally exhibit strong hyperchromism. Typically, Raman markers of the aromatic amino acids are about 3-fold more intense in the UVRR spectrum of fd than in spectra of the free amino acids. The very high Raman cross sections for residues Y21, Y24, and W26 are indicative of unusual hydrophobic environments in the viral assembly. (4) UVRR band shifts that accompany the transfer of fd from H20 to D20 solution indicate that bases of the packaged ssDNA are readily exchanged by the solvent. Similarly, the indole N1H group of W26 is accessible to solvent, as shown by N1H → N1D exchange in D20 solution. (5) The UVRR markers of the packaged fd genome confirm the conclusion reached previously from off-resonance Raman studies that fd DNA nucleosides favor the C3'-endo/anti conformation, rather than the C2'-endo/anti conformation that is characteristic of the lowest energy structure of DNA. We conclude that nucleoside conformations of the packaged fd genome are influenced by the specific organization of ssDNA and coat protein subunits in the native virion assembly.

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

10.1021/bi970342q

✓ **نام ژورنال**:

Biochemistry

✓ **سال انتشار**:

1997

✓ **کلیدواژه** (Keywords):

✓ عنوان پژوهش:

Active site properties of the 3C proteinase from hepatitis A virus (a hybrid cysteine/serine protease) probed by Raman spectroscopy

✓ نویسندگان:

Dinakarpandian D., Shenoy B., Pusztai-Carey M., Malcolm B.A., Carey P.R.

✓ خلاصه پژوهش:

Although the HAV 3C proteinase is a cysteine protease, it displays an active site configuration which resembles mammalian serine proteases and is structurally distinct from the papain superfamily of thiol proteases. Given the interesting serine/cysteine protease hybrid nature of HAV 3C, we have probed its active site properties via the Raman spectra of the acyl enzyme, 5-methylthiophene acryloyl HAV 3C, using the C24S variant of the enzyme to obtain stoichiometric acylation. The Raman difference spectral data show that the major population of the acyl groups in the active site experiences electron polarization intermediate between that in the papain superfamily and that in a nonpolarizing site. This is evidenced by the values of the acyl group ethylenic stretching frequency which occur near 1612 cm-1 in a nonpolarizing environment, at 1588 cm-1 when bound to HAV 3C (C24S), and at 1579 cm-1 in acyl papains. The value of the electronic absorption maximum for the HAV 3C (C24S) acyl enzyme and the deacylation rate constant fit the correlation developed for the papain superfamily, suggesting that for HAV 3C too, polarizing forces in the active site can contribute to rate acceleration via transition state stabilization. The major population in the active site is s-cis about the acyl group's C1-C2 bond, but there is a second population that is s-trans, and this secondary population is not polarized. The two populations are evidenced by the presence of two sets of marker bands for s- cis and s-trans in the Raman spectra, which occur principally in the C=C stretching region near 1600 cm-1, in the C-C stretching region near 1100 cm-1, and near 560 cm-1. The positions of the acyl carbonyl features in the Raman spectra point to hydrogen-bonding strengths of 20-25 kJ mol-1 between the C=O and H-bonding donors in the active site. The 5- methylthiophene acryloyl HAV 3C (C24S) is a relatively unreactive acyl enzyme, deacylating with a pK(a) of 7.1 and a rate constant of 0.000 31 s- 1 at pH 9. Unlike most other cysteine or serine protease acyl enzymes characterized by Raman spectroscopy, no changes in the Raman spectrum could be detected with changes in pH.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/bi963148x

✓ نام ژورنال:

Biochemistry

✓ سال انتشار:

1997

✓ کلیدواژه (Keywords):

✓ **عنوان پژوهش**:

Raman insights into the mechanism of action of hepatitis a virus 3c proteinase: a natural serine/cysteine hybrid protease

✓ **نویسندگان**:

Shenoy B.C., Dinakarpandian D., Austin N., Malcolm B.A., Carev P.R.

✓ **خلاصه پژوهش**:

The hepatitis virus 3C proteinase (HAV-3C) cleaves the single translationa] product of the virus into functional polypeptides. The 3D structure of HAV-3C resembles that of serine proteases even though it has a cysteine residue at the active site. The use of 5-methyl thienyl acryloyl imidazolide as a model substrate results in a stable thioester enzyme intermediate that has been studied by absorption and Raman difference spectroscopy. The deacylation profile obtained by absorption spectroscopy suggests the presence of an active site residue with a pK. of 7.0, evidence of functional similarity with the serine proteases. The bound acyl group appears to be moderately polarized, and shows rotational isomerism in the active site about the Ci-Cj single bond. Only the s-cis isomer shows vibrational coupling to the carbonyl. Peaks corresponding to motion of the acyl group-to-enzyme C-S bond are seen. The absorption maximum shows an expected blue shift with a rise in pH. However, perplexingly, the Raman signals show no evidence of any response to a change in pH.

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

✓ **نام ژورنال**:

FASEB Journal

✓ **سال انتشار**:

1996

✓ **کلیدواژه** (Keywords):

TEKSAN
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✓ عنوان پژوهش:

Orientation of tryptophan-26 in coat protein subunits of the filamentous virus Ff by polarized Raman microspectroscopy

✓ نویسندگان:

Tsuboi M., Overman S.A., Thomas Jr. G.J.

✓ خلاصه پژوهش:

The Ff filamentous virus, which includes the closely related strains fd, fl, and MI3, serves as a model for membrane protein assembly and is employed extensively as a cloning vector and vehicle for peptide display. The threadlike virion (≃6 x 880 nm) comprises a single-stranded DNA genome sheathed by ≃2700 copies of a 50-residue α-helical subunit, the product of viral gene VIII. The pVIII subunit contains a single tryptophan residue (tryptophan-26) which is essential for assembly. We have employed polarized Raman microspectroscopy to determine the orientation of tryptophan-26 in pVIII subunits of oriented fd fibers. The present application is based upon the transfer of tryptophan Raman tensors from a recent study of N-acetyl-L- tryptophan single crystals [Tsuboi et al. (1996) J. Mol. Struct. 379, 43- 50]. The polarized Raman spectra of fd indicate that the plane of the indole ring in each pVIII subunit is close to parallel to the virion axis. In this orientation, the line connecting indole ring atoms N1 and C2 is nearly perpendicular to the virion axis, while the indole pseudo-2-fold axis (a line connecting atom C2 to the midpoint of the C5-C6 bond) is approximately 36° from the virion axis. We have used the present results in combination with preferred tryptophan side-chain torsions [χ1 (C3-Cβ-Cα-N) and χ2,1 (C2-C3-Cβ-Cα)] in other proteins and a previously determined experimental value of χ2,1 in fd [Aubrey, K. L., and Thomas, G. J., Jr. (1991) Biophys. J. 60, 1337-1349] to propose a detailed molecular model for the orientation of the tryptophan-26 side chain in the native virus.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/bi9527707

✓ نام ژورنال:

Biochemistry

✓ سال انتشار:

1996

✓ کلیدواژه (Keywords):

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Raman linear intensity difference of flow-oriented macromolecules: Orientation of the indole ring of tryptophan-26 in filamentous virus fd

✓ نویسندگان:

Takeuchi H., Matsuno M., Overman S.A., Thomas Jr. G.J.

✓ خلاصه پژوهش:

Raman linear intensity difference (RLID) method has been developed to determine orientations of chromophores in filamentous macromolecular assemblies. The method involves orientation of the filaments by hydrodynamic shear force and measurement of intensity differences between Raman spectra excited with laser polarizations parallel and perpendicular to the direction of orientation. Analysis of the RLID spectrum is simplified when the chromophore exhibits a vibrational mode for which the Raman band is enhanced by laser irradiation in resonance with a single molecular electronic transition. In the case of tryptophan, two such modes can be identified: The Raman bands corresponding to indole normal modes ω2 and ω16 gain intensity predominantly through resonance with L(a) and B(b) electronic transitions, respectively, when excited by laser wavelengths of 266 and 240 nm. We have oriented the filamentous bacterial virus fd by hydrodynamic shear force in a velocity gradient flow cell and examined the orientation of the single indole ring (tryptophan-26) in the major coat protein subunit (pVIII) of the virion. The indole ring is found to be inclined at 31 ± 4° from the virion axis with its pseudo-2-fold axis at an angle of 38 ± 6° to the virion axis. Using the indole ring orientation determined by the RLID method and the side chain torsion χ2,1 (dihedral angle Cα-Cβ-C3-C2) determined from the Raman ω3 band, the conformation of the W26 side chain in the viral coat protein has been determined. Similar analysis has been applied to the tyrosine-21 and tyrosine-24 residues of the pVIII subunit. On the basis of the present results, a molecular model is proposed for the pVIII subunit of the native fd assembly. The model is also consistent with data from fiber X-ray diffraction analysis and polarized Raman microspectroscopy of oriented fd fibers.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/ja953923g

✓ نام ژورنال:

Journal of the American Chemical Society

✓ سال انتشار:

1996

✓ کلیدواژه (Keywords):

✓ **عنوان پژوهش**:

Want to exchange your virus? Try microdialysis and Raman.

✓ **نویسندگان**:

Carey P.R.

✓ **خلاصه پژوهش**:

[No abstract available]

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

10.1016/S0006-3495(96)79490-0

✓ **نام ژورنال**:

Biophysical journal

✓ **سال انتشار**:

1996

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Raman Spectroscopy of the Filamentous Virus Ff (fd, f1, M13): Structural Interpretation for Coat Protein Aromatics

✓ نویسندگان:

Overman S.A., Thomas G.J., Jr.

✓ خلاصه پژوهش:

Site-specific isotope substitutions in the coat protein (pVIII) of the filamentous bacterial virus Ff (fd, fl, M13) have been employed to advance vibrational band assignments and facilitate structural interpretation of the Raman spectrum. We report spectra of phage fd assembled in vivo from pVIII subunits incorporating either deuteriophenylalanine (Fds), deuteriotryptophan (Wds), or deuteriotyrosine (Yd4) residues with labeled ring sites. The deuterated aromatics were introduced into fd individually and in combination. On the basis of observed isotope shifts, definitive assignments have been developed for all prominent Raman bands diagnostic of the pVIII aromatic residues (Fl 1, F42, F45, W26, Y21, Y24). The present study constitutes the first direct experimental determination of Raman fingerprints of tyrosine and phenylalanine side chains within hydrophobic a-helical domains and yields unexpected results. Importantly, neither Y21 nor Y24 of pVIII exhibits the “canonical” Fermi doublet expected in the 820-860 cm-1interval of the Raman spectrum. Instead, each tyrosine exhibits a single band near 853 cm-1. Since the application of denaturing conditions is sufficient to generate in fd an apparent Fermi doublet, it is concluded that the anomalous singlet is intrinsic to tyrosine environments in the native virion assembly. In addition, the Raman results clearly demonstrate an interdependence of the environments of aromatic side chains in virion subunits. We show that the results on fd isotopomers are also confirmed by Raman spectroscopy of Ff virions incorporating the tyrosine mutations Y21M, Y24M, and Y21F/Y24S. The Raman marker bands identified for pVIII aromatics modify and extend Raman correlations proposed previously for proteins. The unusual environments detected for aromatic residues in the mature Ff assembly are discussed in relation to recently proposed models for filamentous virion architecture. © 1995, American Chemical Society. All rights reserved.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/bi00016a015

✓ نام ژورنال:

Biochemistry

✓ سال انتشار:

1995

✓ کلیدواژه (Keywords):

✓ عنوان پژوهش:

Viruses and Raman spectroscopy: Determination of secondary structures of viral capsids and chromosomes by difference methods

✓ نویسندگان:

Aubrey K.L., Towse S.A., Thomas G.J., Jr.

✓ خلاصه پژوهش:

Vibrational spectra of the double-stranded DNA genome of an icosahedral virus (P22) in packaged and unpackaged states have been accurately compared by digital difference Raman spectroscopy. The difference Raman spectrum, which is sensitive to structural changes at the level of <2% of a given nucleotide type, reveals the effects of packaging upon sugar pucker, glycosyl orientation, phosphodiester geometry, base pairing, base stacking and the electrostatic environment of DNA phosphate groups. At the experimental conditions employed, the B form secondary structure of unpackaged P22 DNA is minimally perturbed by packaging the viral genome in the virion capsid. However, the electrostatic environment of DNA phosphates is dramatically altered with packaging. Specifically, we find: (1) C2'-endo sugar pucker and anti glycosyl orientations are conserved for all nucleosides. (2) Watson-Crick pairing is completely retained. (3) Alternative secondary structures are not evident in either the packaged or unpackaged viral genome. (4) Small Raman hyperchromic effects (<10%) observed for certain marker bands of dG, dA and dT in the packaged state of P22 DNA suggest slightly reduced base-stacking interactions with packaging. (5) Marginal intensity changes within the envelope of the phosphodiester B form Raman marker band (825-845 cm-1) are consistent with a small net change in DNA groove dimensions attendant with packaging, interpreted as a net narrowing of the minor groove of B form DNA, as has been observed for AT-rich sequences. (6) A large intensity decrease in the phosphodioxy Raman marker band with packaging is shown by analogy with model compounds to reflect increased electrostatic shielding of phosphates for the packaged genome. On the basis of model compound studies, the observed effect is judged to be equivalent to an approximate 10-fold increase in the local Mg2+ concentration in the packaged state of P22 DNA. These findings are compared with structural changes in protein subunits of the P22 viral capsid, attendant with capsid expansion and DNA packaging. We find no evidence in the Raman spectrum of specific intermolecular interactions involving capsid protein and major groove sites of packaged DNA. The present results suggest a simple model for organization of the condensed dsDNA chromosomes of icosahedral viruses. © 1993 SPIE. All rights reserved.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1117/12.146127

✓ نام ژورنال:

Proceedings of SPIE - The International Society for Optical Engineering

✓ سال انتشار:

1993

✓ کلیدواژه (Keywords):

✓ **عنوان پژوهش**:

Study the protein structure of insect virus (PrGV) by laser raman spectroscopy

✓ **نویسندگان**:

Bao P., Lui X.M., Huang T.Q., Liu S.G.

✓ **خلاصه پژوهش**:

We report here our observation of Raman spectrum of the Granulosis Virus of cabbage butterfly Preris rapae (PrGV) and invertigate the protein structure of the inclusion body of PrGV. The intense Amide HI line at 1248cm-1 and Amide I line at 1668cm-1in the Raman spectrum of PrGV contains a predominantly random-Coil or β-turn secondary structure. The intensities ratio of the tyrosyl lines 850cm-1 and 830cm-1 was found to be 1.25, it indicates the tyrosyl residues are exposed to a solvent. According to s-s stretching vibration frequency 509cm-1, the protein molecules of PrGV have gauche-gauche-gauche linkage. The strong peak at 1367cm-1is typical of Tryptophans buried in a hydrophobic environment. © 1893 SPIE.

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

10.1117/12.145254.full

✓ **نام ژورنال**:

Proceedings of SPIE - The International Society for Optical Engineering

✓ **سال انتشار**:

1993

✓ **کلیدواژه** (Keywords):

✓ **عنوان پژوهش**:

The study of Turnip Mosaic virus coat protein by surface enhanced Raman spectroscopy

✓ **نویسندگان**:

Deng H., He Q., Xu Z., Wang X., Sheng R.

✓ **خلاصه پژوهش**:

Using Turnip Mosaic virus (TuMV) coat protein as material, the secondary structure has been studied by both normal Raman spectroscopy (NRS) and surface enhanced Raman spectroscopy (SERS). The NRS of TuMV coat protein under certain conditions showed the α-helix, β-sheet and random coil structure. The CSSC comformations are trans-gauche-gauche and gauche-gauche-gauche. The SERS spectrum of TuMV coat protein under certain conditions reveals the α-helix structure. By studying SERS at different adsorbing times, we have observed the amide III vibration of α-helix, β-sheet and random coil structure. The CSSC conformations drawn from the SERS spectra are trans-gauche-gauche and trans-gauche-trans. Besides the amide I, amide III and CSSC bands, the CαCN band, aromatic amino acid bands and some other bands can also be seen in the SERS spectra. © 1993.

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

10.1016/0584-8539(93)80238-6

✓ **نام ژورنال**:

Spectrochimica Acta Part A: Molecular Spectroscopy

✓ **سال انتشار**:

1993

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Raman dynamic probe of hydrogen exchange in bean pod mottle virus: base-specific retardation of exchange in packaged ssRNA

✓ نویسندگان:

Li T., Johnson J.E., Thomas G.J., Jr

✓ خلاصه پژوهش:

We describe a novel approach to investigating exchange kinetics in biological assemblies. The method makes use of a Raman multichannel analyzer coupled with a dialysis flow cell. We employ this methodology to determine exchange rates of labile hydrogens in both the packaged RNA genome and protein subunits of bean pod mottle virus (BPMV). In the BPMV assembly, which is similar to human picornaviruses, the x-ray structure indicates that about 20% of the ssRNA chain is ordered at the threefold vertices of the icosahedral capsid, although the nucleotide bases in the ordered segments are not known (Chen et al., 1989). Here, we compare exchange profiles of the native virus with those of the empty capsid, model nucleic acids and aqueous solvent to reveal the following exchange characteristics of BPMV RNA and protein: (i) Base-specific retardation of exchange is observed in the packaged RNA. (ii) Retardation is greatest for uracil residues, for which the first-order exchange rate constant (kU = 0.18 +/- 0.02 min-1) is 40% lower than that of either the H2O solvent or adenine or cytosine groups of RNA (ksolv approximately kA approximately kC = 0.30 +/- 0.02 min-1). (iii) Retardation of exchange is also observed for the guanine residues of packaged RNA. (iv) No appreciable exchange of amide NH groups of capsid subunits occurs within the time of complete exchange (t approximately 10 min) of packaged RNA or bulk solvent. Thus, the present results identify sites in both the protein subunits (amide NH) and RNA nucleotides (amino NH2 and imino NH) which are resistant to solvent-catalyzed hydrogen exchange. We propose that retardation of exchange of labile sites of the RNA nucleotides is a consequence of the organization of the RNA chromosome within the virion. Our findings support a model for BPMV in which surface and buried domains of capsid subunits are extensively and rigidly hydrogen-bonded, and in which uracil and guanine exocyclic donor groups of packaged RNA are the principal targets for subunit interaction at the threefold vertices of the capsid. © 1993, The Biophysical Society. All rights reserved.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/S0006-3495(93)81272-4

✓ نام ژورنال:

Biophysical Journal

✓ سال انتشار:

1993

✓ کلیدواژه (Keywords):

✓ **عنوان پژوهش**:

Molecular interactions in viruses investigated by Raman spectroscopy: the chromosome and capsid of bacterial virus P22

✓ **نویسندگان**:

Thomas Jr. George J.

✓ **خلاصه پژوهش**:

Laser Raman scattering is the method of choice for probing macromolecular structures and interactions in complex biological assemblies. The Raman technique is a valuable complement to high-resolution structure methods applied to biological molecules in the crystal (x-ray crystallography) and to static and dynamic light scattering methods applicable to solutions. Raman spectroscopy is particularly well suited to investigating assembly mechanisms of viruses and conformations of their nucleic acid and protein constituents. Here we describe the use of digital difference Raman methods to probe structures of the double-stranded (ds) DNA genome of the icosahedral virus P22 in packaged and unpackaged states. The findings are compared with structural changes in protein subunits of the P22 viral capsid, attendant with capsid expansion and DNA packaging. We find no evidence in the Raman spectrum of specific intermolecular interactions involving capsid protein and major groove sites of the packaged DNA. The present results suggest a simple model for organization of condensed dsDNA chromosomes in icosahedral viruses.

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

✓ **نام ژورنال**:

Proceedings of SPIE - The International Society for Optical Engineering

✓ **سال انتشار**:

1993

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Cysteine conformation and sulfhydryl interactions in proteins and viruses. 3. Quantitative measurement of the Raman S-H band intensity and frequency

✓ **نویسندگان**:

Tuma R., Vohník S., Li H., Thomas G.J., Jr

✓ **خلاصه پژوهش**:

The bond stretching vibration of the cysteine sulfhydryl (SH) group in a typical protein generates a Raman band in the spectral interval 2500–2600 cm-1, a region devoid of interference from any other fundamental mode of vibration of the protein. The relatively high Raman cross section associated with the S-H stretching vibration, the sensitivity of the vibrational frequency to hydrogen bonding interactions and side chain configurations, and the dependence of the Raman intensity on thiol-thiolate equilibria, combine to make the Raman SH band a potentially valuable marker of protein sulfhydryl interactions and a unique indicator of sulfhydryl participation in thiol-disulfide oxidoreductase activity. In order to exploit Raman spectroscopy for these purposes, accurate and precise measurements of Raman SH band profiles are required. We show here that the required precision and accuracy can be achieved by use of the Raman band corresponding to the stretching vibration of in situ nitrogen gas as a quantitative intensity and frequency standard. The Raman Q-branch center of the N2 band occurs at 2330.7 cm-1. © 1993, The Biophysical Society. All rights reserved.

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

10.1016/S0006-3495(93)81172-X

✓ **نام ژورنال**:

Biophysical Journal

✓ **سال انتشار**:

1993

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Raman spectroscopic study on the conformation of a peptide fragment representing the DNA-binding domain of filamentous virus Pf3 coat protein

✓ **نویسندگان**:

Miura T., Takeuchi H., Harada I.

✓ **خلاصه پژوهش**:

Raman spectra have been measured of a nonapeptide which has an amino acid sequence identical to that of the C-terminal region of the major coat protein subunit of Filamentous bacteriophage Pf3. The peptide shows a strong tendency to form a β-sheet structure in aqueous solution. The β-sheet formation is significantly promoted by complexation with single-stranded DNA but not with double-stranded DNA. It is suggested that the C-terminal region of the Pf3 coat protein binds to the single-stranded DNA genome in the virion with a β-sheet conformation, in sharp contrast with the α-helical binding in other filamentous bacteriophages. © 1992.

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

10.1016/0014-5793(92)80763-7

✓ **نام ژورنال**:

FEBS Letters

✓ **سال انتشار**:

1992

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Surface-enhanced Raman spectroscopy of inclusion body of Darna trima Granulosis Virus

✓ **نویسندگان**:

Liu Xinmin, Huang Tianquan, Wu Tieqiao, Bao Peidi, Yang Guangming, Zhou Zhongbi

✓ **خلاصه پژوهش**:

The surface-enhanced Raman spectra of the inclusion body of Darna trima Granulosis Virus (DtGV) absorbed on silver hydrosol have been obtained and analysed. Both amino and carboxylate groups of the inclusion body envelope protein of DtGV bound to silver hydrosol. The side-chains of Trp residues are closed to the surface of silver. The peptide groups of proteins are screened by the side-chains of amino acid residues which impede the efficient enhancement of corresponding vibrations.

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

✓ **نام ژورنال**:

Guang Pu Xue Yu Guang Pu Fen Xi/Spectroscopy and Spectral Analysis

✓ **سال انتشار**:

1992

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Conformations, Interactions, and Thermostabilities of RNA and Proteins in Bean Pod Mottle Virus : Investigation of Solution and Crystal Structures by Laser Raman Spectroscopy

✓ نویسندگان:

Li T., Thomas G.J., Jr., Chen Z., Johnson J.E.

✓ خلاصه پژوهش:

We report and interpret laser Raman spectra of the three virion components of bean pod mottle virus (BPMV). The top component of BPMV is an empty capsid; middle and bottom components package the RNA2 and RNA1 genome segments, respectively. All components were investigated as both single crystalsand aqueoussolutions, the latter over wide ranges of temperature and ionic strength. The isolated RNA2 molecule of BPMV middle component was also investigated in both H20 and D20 solutions. The results permit assessment of RNA and protein structures, their mutual interactions in the virions, and their conformational thermostabilities and comparison of these structural characteristics for solution and crystal states of the particles. The principal findings of this study are (i) The extent of ordered A-form backbone (74%) and of base pairing (38% AU + 22% GC) in unpackaged (aqueous) RNA2 are significantly altered by packaging. The A-form secondary structure of RNA2 is increased by 12 ± 4%, and guanine base interactions are also substantially increased with packaging, (ii) The thermostability of Raman-monitored secondary structure of unpackaged RNA2(Tm≈ 43 °C) is greatly increased in the packaged state(Tm53 °C). This increase corresponds to a stabilization of the A-form backbone geometry in 15 ± 5% of genome nucleotides, (iii) Packaging of RN A2 in the middle component stabilizes subunit-subunit interactions of the capsid, as evidenced by a thermal denaturation temperatureTd≈ 65 °C for the virion, compared with 7a ≈ 55 °C for the empty capsid. (iv) Raman marker-band shifts implicate the purine 7N sites of RNA2 and aromatic side chains of subunits as the principal targets for RNA-subunit interaction, (v) At the conditions of the present experiments (8 °C, pH 7, moderate ionic strength), the subunit secondary structures observed for solutions of the top, middle, and bottom components are indistinguishable by Raman spectroscopy from secondary structures observed for corresponding crystalline samples, (vi) On the other hand, side chains of subunits in the top component (empty capsid) yield significantly different Raman intensities in crystalline and solution states. These differences are interpreted as the result of changes in a small number of side-chain environments between crystal and solution, (vii) Similarly, small differences exist between RNA Raman markers of crystalline and aqueous virions, which are attributed to altered environments of nucleotide residues and to a small increase in the amount of A-form backbone geometry upon going from the crystal to the solution, (viii) We have compared the Raman spectral differences between crystal and solution states of BPMV components with spectral differences observed as a function of solution ionic strength. The results lead to the conclusion that Raman spectral differences between crystal and solution forms of the virions are mainly the consequence of different electrostatic environments of the packaged RNA molecules in the two states. © 1992, American Chemical Society. All rights reserved.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/bi00144a006

✓ نام ژورنال:

Biochemistry

✓ سال انتشار:

1992

✓ کلیدواژه (Keywords):

✓ عنوان پژوهش:

Cysteine Conformation and Sulfhydryl Interactions in Proteins and Viruses. 1. Correlation of the Raman S-H Band with Hydrogen Bonding and Intramolecular Geometry in Model Compounds

✓ نویسندگان:

Li H., Thomas G.J., Jr.

✓ خلاصه پژوهش:

The cysteine sulfhydryl group plays an important role in structural biochemistry. Cysteine thiols of proteins are capable of donating and accepting hydrogen bonds with solvent molecules as well as with other protein groups, and cysteine ligand coordination is fundamental to enzyme activity and nucleic acid recognition. We have undertaken a systematic Raman study of model mercaptans and cysteine thiols to provide an effective spectroscopic probe of the S-H group and its biologically relevant configurations and interactions in aqueous and crystalline proteins. The present study of aliphatic and aromatic mercaptans in both polar and apolar solvents, and of l-cysteine and glutathione in the crystal, provides a basis for interpreting the S-H stretching region of the Raman spectrum in terms of hydrogen bond donation by S-H, hydrogen bond acceptance by S, and rotamer populations of the cysteinyl side chain. The most definitive change observed in the Raman S-H stretching band is its shift to lower frequency when S-H acts as a hydrogen bond donor. We find further that the frequency interval in which the Raman S-H stretching vibration (σSH) occurs is diagnostic of S-H donors which are strongly hydrogen bonded (2525–2560 cm−1), moderately hydrogen bonded (2560–2575 cm−1), or weakly hydrogen bonded (2575–2580 cm−1). When the S-H group is essentially non-hydrogen-bonded, e.g., at high dilution in CCl4, we find σSH ≈ 2585 ± 5 cm−1. On the other hand, hydrogen bond acceptance by S in the absence of S-H donation elevates σSH slightly (<4 cm−1). In model mercaptans, PC and PH rotamers with respect to the C-C-S-H torsion (X2) yield σSH values that are separated by approximately 10 cm−1, with the PH rotamer generally exhibiting the higher frequency of the two. Since the S-H region of the Raman spectrum contains no interference from other molecular vibrations, the approximate 10-cm−1 shift should be measurable in proteins and thus should provide a means of resolving different cysteine side-chain orientations. © 1991, American Chemical Society. All rights reserved.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/ja00002a012

✓ نام ژورنال:

Journal of the American Chemical Society

✓ سال انتشار:

1991

✓ کلیدواژه (Keywords):

✓ **عنوان پژوهش**:

Advances in structural studies of viruses by Raman spectroscopy

✓ **نویسندگان**:

Towse Stacy A., Benevides James M., Thomas Jr. George J.

✓ **خلاصه پژوهش**:

[No abstract available]

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

10.1117/12.57327

✓ **نام ژورنال**:

Proceedings of SPIE - The International Society for Optical Engineering

✓ **سال انتشار**:

1991

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ عنوان پژوهش:

Structural Studies of Bean Pod Mottle Virus, Capsid, and RNA in Crystal and Solution States by Laser Raman Spectroscopy

✓ نویسندگان:

Li T., Chen Z., Johnson J.E., Thomas G.J., Jr., Li T., Chen Z., Johnson J.E., Thomas G.J., Jr.

✓ خلاصه پژوهش:

Structures of protein and RNA components of bean pod mottle virus (BPMV) have been investigated by use of laser Raman spectroscopy. Raman spectra were collected from both aqueous solutions and single crystals of BPMV capsids (top component) and virions (middle and bottom components, which package, respectively, small and large RNA molecules). Analysis of the data permits the assignment of conformation-sensitive Raman bands to viral protein and RNA constituents and observation of structural similarities and differences between solution and crystalline states of BPMV components. The Raman results show that the protein subunits of the empty capsid contain between 45% and 55% ß-strand and ß-turn secondary structure, in agreement with the recently determined X-ray crystal structure, and that this total ß-strand content undergoes a small increase (~5 %) with packaging of RNA. The subunits are relatively deficient in α-helix secondary structure, estimated at <25%, and therefore must contain extensive amounts (>20%) of loops and irregular chain conformations. The Raman spectra also show the following: (1) The molecular environments of as many as four tryptophan residues per subunit are altered upon packaging RNA, resulting in stronger 1N-H hydrogen bonding for two Trp residues and more hydrophobic environments for two indole rings. (2) Hydrogen-bonding states of the seven Tyr residues per subunit do not change detectably when RNA is packaged. At least five tyrosine OH groups are involved exclusively as strong hydrogen bond donors to protein acceptor groups, which suggests restricted access of solvent H2O molecules to these parahydroxyls. (3) Hydrogen-bonding states of the 14 Cys S-H groups are the same in top, middle, and bottom components. (4) Bands of the ionized carboxyl groups of Asp and Glu are detected in all viral components and no differences occur in these bands with RNA packaging. (5) Significant rearrangement of aliphatic side chains within the viral capsid may occur with packaging of RNA. (6) BPMV middle and bottom components exhibit no detectable differences in subunit secondary structure. A comparison of Raman spectra of crystal and solution states of the BPMV middle component reveals only minor structural differences between the two, and these are restricted almost exclusively to Raman bands of RNA in the region of assigned phosphodiester conformation markers. Although in both the crystal and solution only C3' endo / anti nucleosides are detected, the crystal exhibits a weaker 813-cm−1 band and stronger 870-cm−1 band, which suggests that ~8% (±3% uncertainty) of the nucleotides have O-P-O torsions configured differently in the crystal from that in the solution. © 1990 American Chemical Society. All rights reserved.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1021/bi00473a004

✓ نام ژورنال:

Biochemistry

✓ سال انتشار:

1990

✓ کلیدواژه (Keywords):

✓ **عنوان پژوهش**:

Raman Spectroscopy of Mercury(II) Binding to Two Filamentous Viruses: Ff (fd, M13, f1) and Pf1*

✓ **نویسندگان**:

Day L.A., Casadevall A., Prescott B., Thomas G.J.

✓ **خلاصه پژوهش**:

Ff and Pfl are filamentous bacteriophages. Each contains, in a central core region surrounded by protein, a circular single-stranded DNA molecule, and it is known that the DNA bases are sites of Hg(II) binding. In the present study, Raman spectra were obtained for the two viruses in the presence of increasing amounts of Hg(II), with ratios (m) of Hg(II) added per nucleotide residue in the range 0 < m < 2.0. Hg(II) binding to the viruses induces Raman intensity changes in previously assigned Raman lines of viral DNA, demonstrating metal binding to the DNA bases, but also in many lines assigned to protein. The overall structures of the viruses do not change with Hg(II) binding, and the Raman spectra indicate little, if any, change in protein secondary structure. Changes in certain protein Raman lines induced by Hg(II) binding to the DNA for low values of m are attributed to altered interactions between solvent and protein side chains, aliphatic groups being the most affected. The nature of such changes for both viruses suggests DNA-protein linkage. In Pfl, lines assigned to ring vibrations of all four bases are perturbed upon initial addition of Hg(II) to m = 0.25. In Ff, however, lines assigned to base ring vibrations are not perturbed until m ≥ 0.5. The results provide additional evidence for fundamentally different DNA structures in Ff and Pf1. © 1988, American Chemical Society. All rights reserved.

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

10.1021/bi00402a032

✓ **نام ژورنال**:

Biochemistry

✓ **سال انتشار**:

1988

✓ **کلیدواژه** (Keywords):

✓ **عنوان پژوهش**:

Ultraviolet resonance Raman spectroscopy as a probe of protein structure in the fd virus.

✓ **نویسندگان**:

Grygon C.A., Perno J.R., Fodor S.P., Spiro T.G.

✓ **خلاصه پژوهش**:

Resonance Raman spectroscopy can provide details of molecular structure via the enhancement of specific vibrational bands in the spectrum of the scattered light when the laser excitation is tuned to electronic absorption wavelengths of the molecule. The availability of lasers operating in the deep ultraviolet region makes it possible to apply this technique to problems of protein structure. The backbone conformation and the environments of aromatic side chains can be probed via appropriate enhancement of selected vibrational modes. In this article we investigate ultraviolet resonance Raman (UVRR) spectra from the coat protein of the filamentous bacteriophage, fd, in the intact virus and in sodium dodecyl sulfate (SDS) suspension. The results indicate that 1) the protein is completely alpha-helical in the mature virus, but loses a large fraction of its helix content in the SDS micelles. 2) The two tyrosine residues appear to behave as H-bond acceptors in the intact phage but this interaction is lost in the micelles. 3) The tryptophan residue is not solvent-exposed in either protein conformation, although in SDS it is accessible to H/D exchange with the solvent. 4) The three phenylalanine residues are involved in stacking interactions in the intact virus; these are disrupted in the SDS micelles. 5) The single proline residue appears to be in a trans conformation both in the virus and in the micelles.

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

✓ **نام ژورنال**:

BioTechniques

✓ **سال انتشار**:

1988

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Nucleic acid and protein structures and interactions in viruses investigated by laser Raman spectroscopy

✓ **نویسندگان**:

Thomas Jr. G.J.

✓ **خلاصه پژوهش**:

Raman spectroscopy may be profitably exploited to determine details of protein and nucleic acid structures and their mutual interactions in viruses and gene regulatory complexes. Present applications use data obtained from model nucleic acid crystals, fibers and solutions to reveal preferred backbone and nucleoside conformations for different morphological states of DNA and RNA in plant (TMV, BDMV) and bacterial viruses (P22, Pfl, Xf, Pf3, fd, Ifl, IKe). Interpretation of the results is enhanced by deconvolution methods which, in favorable cases, permit quantitative conclusions regarding macromolecular structures. Both equilibrium and dynamic Raman applications are described. © 1986.

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

10.1016/0022-2860(86)80332-5

✓ **نام ژورنال**:

Journal of Molecular Structure

✓ **سال انتشار**:

1986

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Dissipative respiration and Raman spectroscopy: A possible guide to latent viruses and the oncogenic process

✓ **نویسندگان**:

Webb S.J.

✓ **خلاصه پژوهش**:

The 5-250cm-1 laser-Raman and millimeter microwave spectral lines of tumour cells, and those carrying latent viruses, display double or triple splitting of the single peaked spectral lines from homologous normal ones. From a new mathematical spectral analysis all lines appear to emanate from the transport of 2H+ to the environment which, by equal and opposite forces, produces proton waves travelling along defined in-vivo routes which set large macromolecular complexes in oscillation at a frequency set by the rate of 2H+ dissipation. The splitting of the spectral lines seems due to be structural gaps in the membrane which disallow normal propagation and in-vivo travel of proton waves. These gaps appear the result of the absence, or oxidation, of a single COOH of an aminoacid residue of a membrane structural protein. An alternative treatment for tumours, residing in the bridging of such gaps with non-oxidizable aminoacid analogues, perhaps as a 2 to 3 aminoacid peptide, is suggested.

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

✓ **نام ژورنال**:

IRCS Medical Science

✓ **سال انتشار**:

1986

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Protein-RNA Interactions in Belladonna Mottle Virus Investigated by Laser Raman Spectroscopy

✓ **نویسندگان**:

Prescott B., Thomas G.J., Jr., Sitaraman K., Argos P.

✓ **خلاصه پژوهش**:

Raman difference spectroscopy of the belladonna mottle virus (BDMV) and its separated RNA and protein components indicates that molecular interaction occurs between the single-stranded RNA genome and capsid subunits. The molecular interactions that stabilize the virion at pH 5.0 are altered or eliminated at pH 8.0, even though release of the RNA from the capsid is prevented by the addition of divalent metal cations (Ca2+). From the perturbations that occur to Raman lines of cytosine and adenine rings of the encapsidated RNA molecule between pH values of 5.0 and 8.0, it is concluded that cytosines are protonated in significant numbers at the conditions which maintain the native virus structure and that the stacking of adenines is altered by changes in pH. The degree of protonation of RNA bases can be reduced by elevation of the pH to 8.0 for encapsidated RNA or by release of the RNA from the capsid at pH 5.0. Although the protein groups that interact with the viral RNA cannot be identified unambiguously from the Raman spectra, it is apparent that the molecular environments of aromatic amino acid side chains are altered with the same changes in pH (from 5.0 to 8.0) that perturb the cytosine and adenine ring structures. No significant change in secondary structures of the capsid subunit can be detected with changes in pH or with RNA release. On the other hand, the characteristic Raman lines of the phosphate groups of packaged RNA differ from those of naked RNA at all pH values examined, most likely as a result of specific electrostatic binding of divalent cations to RNA phosphates within the virus shell. © 1985, American Chemical Society. All rights reserved.

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

10.1021/bi00326a026

✓ **نام ژورنال**:

Biochemistry

✓ **سال انتشار**:

1985

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ عنوان پژوهش:

Resolution enhancement in Raman spectra of biological macromolecules by Fourier deconvolution: applications to single-stranded DNA and RNA viruses

✓ نویسندگان:

Thomas Jr. G.J.

✓ خلاصه پژوهش:

The application of a constrained, iterative Fourier deconvolution method to Raman spectra of viruses permits separation of overlapped vibrational bands assigned to viral protein and nucleic acid constituents. The intrinsically broad and extensively overlapped Raman lines, which cannot be resolved by instrumental methods, are sufficiently well separated in the deconvoluted spectra so that band areas may be measured with sufficient accuracy to allow conclusions about the secondary structures and hydrogen bonding interactions of viral molecular components. Deconvolution of Raman scattering in the region 1500-1750 cm-1 of filamentous bacteriophages resolves the contributions of(i)amide I modes ofalpha-helix and beta-strand conformations of the viral coat proteins, (ii) aromatic ring modes of tryptophan, tyrosine and phenylalanine side chains and (iii) purine ring modes of the coated DNA molecule. The results show that among six filamentous viruses the amount of alpha-helix in coat protein subunits decreases in the following order: Pfl (100%) > IKe (93%) > fd (92%) > Ifl (90%) > Pf3 (82%) > Xf (71%). In an application to tobacco mosaic virus (TMV), the complex band in the 800-850 cm-1 region is deconvoluted to resolve contributions from the encapsidated RNA genome at 813 and 822 cm-1, which indicate at least two distinct nucleoside conformers and a contribution from the tyrosine rings of protein subunits at 831 cm-1. Integrated intensity measurements suggest that at least two-thirds of the nucleosides do not contain the usual C3′-endo ring pucker and anti orientation of the glycosidic bond normally associated with nucleoside residues of single-stranded RNA. © 1985.

✓ لینک DOI (استفاده برای دانلود مقاله)

10.1016/0584-8539(85)80100-8

✓ نام ژورنال:

Spectrochimica Acta Part A: Molecular Spectroscopy

✓ سال انتشار:

1985

✓ کلیدواژه (Keywords):

✓ **عنوان پژوهش**:

Quantitative analysis of nucleic acids, proteins, and viruses by Raman band deconvolution

✓ **نویسندگان**:

Thomas G.J., Jr, Agard D.A.

✓ **خلاصه پژوهش**:

A constrained, iterative Fourier deconvolution method is employed to enhance the resolution of Raman spectra of biological molecules for quantitative assessment of macromolecular secondary structures and hydrogen isotope exchange kinetics. In an application to the Pf1 filamentous bacterial virus, it is shown that the Raman amide I band contains no component other than that due to alpha-helix, indicating the virtual 100% helicity of coat proteins in the native virion. Comparative analysis of the amide I band of six filamentous phages (fd, If1, IKe, Pf1, Xf, and Pf3), all at the same experimental conditions, indicates that the subunit helix-percentage ranges from a high of 100% in Pf1 to a low of 71% in Xf. Deconvolution of amide I of Pf3 at elevated temperatures, for which an alpha-to-beta transition was previously reported (Thomas, G. J., Jr., and L. A. Day, 1981, Proc. Natl. Acad. Sci. USA., 78:2962–2966), allows quantitative evaluation of the contributions of both alpha-helix and beta-strand conformations to the structure of the thermally perturbed viral coat protein. Weak Raman lines of viral DNA bases and coat protein side chains, which are poorly resolved instrumentally, are also distinguished for all viruses by the deconvolution procedure. Application to the carbon-8 hydrogen isotope exchange reaction of a purine constituent of transfer RNA permits accurate determination of the exchange rate constant, which is in agreement with calculations based upon curve-fitting methods. © 1984, The Biophysical Society. All rights reserved.

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

10.1016/S0006-3495(84)84074-6

✓ **نام ژورنال**:

Biophysical Journal

✓ **سال انتشار**:

1984

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Structure similarity, difference and variability in the filamentous viruses fd, If1, IKe, Pf1 and Xf. Investigation by laser raman spectroscopy

✓ **نویسندگان**:

Thomas Jr. G.J., Prescott B., Day L.A.

✓ **خلاصه پژوهش**:

The filamentous bacteriophages fd, If1, IKe, Pf1, Xf and Pf3 in aqueous solutions of low, moderate and high ionic strength have been investigated as a function of temperature by laser Raman difference spectroscopy. By analogy with Raman spectra of model compounds and viruses of known structure, the data reveal the following structural features: the predominant secondary structure of the coat protein subunit in each virus is the α-helix, but the amount of α-helix differs from one virus to another, ranging from an estimated high of 100% in Pf1 to a low of approximately 50% in Xf. The molecular environment and intermolecular interactions of tyrosine, tryptophan and phenylalanine residues differ among the different viruses, as do the conformations of aliphatic amino acid side-chains. The foregoing features of coat protein structure are highly sensitive to changes in Na+ concentration, temperature or both. The backbones of A-DNA and B-DNA structures do not occur in any of the viruses, and unusual DNA structures are indicated for all six viruses. The α-helical protein subunits of Pf1, like those of Pf3 and Xf, can undergo reversible transitions to β-sheet structures while retaining their association with DNA; yet fd, IKe and If1 do not undergo such transitions. Raman intensity changes with ionic strength or temperature suggest that trans-gauche rotations of aliphatic amino acid side-chains and stacking of aromatic side-chains are important structural variables in each virus. © 1983 Academic Press Inc. (London) Ltd.

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

10.1016/S0022-2836(83)80260-5

✓ **نام ژورنال**:

Journal of Molecular Biology

✓ **سال انتشار**:

1983

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Structural Studies of Tobacco Mosaic Virus and Its Components by Laser Raman Spectroscopy

✓ **نویسندگان**:

Fish S.R., Hartman K.A., Stubbs G.J., Thomas G.J., Jr.

✓ **خلاصه پژوهش**:

Raman spectra have been recorded for oriented gels of tobacco mosaic virus, aqueous solutions of TMV protein in the form of capsid and disk, and protein-free TMV RNA. The protein-free RNA molecule contains about 80% ordered type-A structure, which is similar to other RNA molecules in solution. RNA in the virus particle does not exhibit the base stacking and pairing normally found in protein-free RNA but instead shows at least two distinct structures characterized by different phosphodiester group frequencies irt the Raman spectrum. Approximately one out of three such linkages retains the type-A geometry characteristic of aqueous RNA, while two out of thfee appear to have a different geometry not encountered previously for RNA. The secondary structure of the TMV tibat protein molecule is similar for the three aggregation states studied (virus, capsid, and disk) and consists of 40-50% a helix, 40-50% irregular structure, and 0-20% ß sheet. Two of the three tryptophan residues per protein molecule reside in hydrophobic regions, and the third is in contact with water. The distribution of the four tyrosine residues per protein moleciile among hydrogen-bonding states is the same fbr capsid and virus but different for the disk. The latter could be a consequence of the presence of CT ions which may form hydrogen bonds with one or more p-hydroxyl groups of tyrosine residues. © 1981, American Chemical Society. All rights reserved.

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

10.1021/bi00529a019

✓ **نام ژورنال**:

Biochemistry

✓ **سال انتشار**:

1981

✓ **کلیدواژه** (Keywords):

✓ **عنوان پژوهش**:

RAMAN SPECTRA OF TOBACCO MOSAIC VIRUS AND ITS COMPONENTS.

✓ **نویسندگان**:

Thomas Jr. G.J., Fish S.R., Hartman K.A.

✓ **خلاصه پژوهش**:

[No abstract available]

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

✓ **نام ژورنال**:

✓ **سال انتشار**:

1980

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Application of Raman spectroscopy to a complex biochemical system: Tobacco mosaic virus and its components

✓ **نویسندگان**:

Fox J.W., Lee J., Amorese D., Tu A.T.

✓ **خلاصه پژوهش**:

[No abstract available]

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

✓ **نام ژورنال**:

Journal of Applied Biochemistry

✓ **سال انتشار**:

1979

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

A comparative study of the structure of tobacco mosaic virus and cucumber virus 4 by laser Raman spectroscopy

✓ **نویسندگان**:

Shie M., Dobrov E.N., Tikchonenko T.I.

✓ **خلاصه پژوهش**:

The results of the study of the structure of two related rod-like viruses, tobacco mosaic virus and cucumber virus 4, by laser Raman spectroscopy are presented. It is found that the structure of the protein subunits of the two viruses differ significantly: the TMV protein has more α-helix and less β-structure than the CV protein. All tryptophan residues in the proteins of both viruses are buried in the hydrophobic environment, and out of the four tyrosine residues present in both proteins, two participate in strong H-binding with COO--groups of acidic amino acids and the two others are exposed to the solvent. Intravirus RNAs of both viruses have the same structure of sugar-phosphate backbone, characterised by the simultaneous presence of at least two different conformations of phosphodiester bonds and of ribose residues. The degree of base stacking in the two intravirus RNAs is much smaller than in helical regions of free RNAs. © 1978.

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

10.1016/0006-291X(78)91437-7

✓ **نام ژورنال**:

Biochemical and Biophysical Research Communications

✓ **سال انتشار**:

1978

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Studies of Virus Structure by Laser-Raman Spectroscopy. Turnip Yellow Mosaic Virus and Capsids

✓ **نویسندگان**:

Hartman K.A., McDonald-Ordzie P.E., Kaper J.M., Prescott B., Thomas G.J., Jr.

✓ **خلاصه پژوهش**:

Laser-Raman spectroscopy of the turnip yellow mosaic virus (TYMV) and its capsid indicate the following features of the structure and assembly of the virion. The secondary structure of coat-protein molecules in TYMV is comprised of 9 ± 5% α-helix, 43 ± 6% β-sheet, and 48 ± 6% irregular conformation and is not altered by the removal of the RNA from the capsid. Introduction of as many as 200 chain scissions per RNA molecule also does not affect the overall secondary structure of the encapsulated RNA, which is 77 ± 5% in the A-helix form. Tryptophan and cysteine residues of the coat protein appear to be in contact with the solvent, while only one of three tyrosines per coat protein is available for hydrogen bonding of its p-hydroxyl group with H2O molecules. Both cytosine and adenine residues of TYMV RNA are protonated in substantial numbers near pH 4.5, suggesting elevation of their respective pKa values within the virion. The Raman data are consistent with chemical evidence favoring interaction between protonated bases of RNA and amino acid side chains of coat protein in TYMV. © 1978, American Chemical Society. All rights reserved.

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

10.1021/bi00604a015

✓ **نام ژورنال**:

Biochemistry

✓ **سال انتشار**:

1978

✓ **کلیدواژه** (Keywords):

TEKSAN Detect Precisely

✓ **عنوان پژوهش**:

Differences between the Structural Dynamics of Plasma Membranes of Normal Hamster Lymphocytes and Lymphoid Cells Neoplastically Transformed by Simian Virus 40 as Revealed by Laser Raman Spectroscopy

✓ **نویسندگان**:

Verma S.P., Schmidt-Ullrich R., Thompson W.S., Wallach D.F.H.

✓ **خلاصه پژوهش**:

The Raman spectra of highly purified plasma membranes from SV40-transformed GD248 lymphocytes have been compared with the spectra of the membranes of normal cells over the spectral region 100 cm-1 to 3010 cm-1. Striking differences between the two membrane categories were observed in the thermal response of the CH-stretching and acoustical regions. Analysis of CH-stretching shows that the membranes of normal cells exhibit a thermal transition centered at 7° and ~5° wide. The membranes of GD248 cells, in contrast, show a lipid transition centered at-5° and 12-18° wide. Analysis of the acoustical region yields equivalent results. The membrane proteins of normal membranes undergo a large thermotropic transition, starting at 39° (sample temperatures), whereas this transition begins at 23° with GD248 plasma membranes. The results suggest the possibility that SV40-specific membrane proteins may modify the collective thermotropic behavior of both normal membrane proteins and membrane lipids. © 1977, American Association for Cancer Research. All rights reserved.

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

✓ **نام ژورنال**:

Cancer Research

✓ **سال انتشار**:

1977

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Studies of virus structure by Laser-Raman spectroscopy. II. MS2 phage, MS2 capsids and MS2 RNA in aqueous solutions

✓ **نویسندگان**:

Thomas Jr. G.J., Prescott B., McDonald-Ordzie P.E., Hartman K.A.

✓ **خلاصه پژوهش**:

Laser-Raman spectra of the bacteriophage MS2, and of its isolated coat-protein and RNA components, have been obtained as a function of temperature in both H2O and D2O (deuterium oxide) solutions. The prominent Raman lines in the spectra are assigned to the amino acid residues and polypeptide backbone of the viral coat protein and to the nucleotide residues and ribosyl-phosphate backbone of the viral RNA. The Raman frequencies and intensities, and their temperature dependence, indicate the following features of MS2 structure and stability. Coat-protein molecules in the native phage maintain a conformation determined largely by regions of β-sheet (~60%) and random-chain (~40%) structures. There are no disulfide bridges in the virion and all sulfhydryl groups are accessible to solvent molecules. Protein-protein interactions in the virion are stable up to 50 °C. Release of viral RNA from the virion does not affect either the conformation of the coat-protein molecules or the thermal stability of the capsid. MS2 RNA within the virion contains a highly ordered secondary structure in which most (~85%) of the bases are either paired or stacked or both paired and stacked and in which the RNA backbone assumes a geometry of the A-type. When RNA is partially or fully released from the virion its overall secondary structure at 32 °C is unchanged. However, the exposed RNA is more susceptible to changes in secondary structure promoted by increasing the temperature. Thus the viral capsid exerts a significant stabilizing effect on the secondary structure of MS2 RNA. This stabilization is ionic-strength dependent, being more pronounced in solutions containing high concentrations of KCl. Raman intensity profiles as a function of temperature reveal that disordering of the MS2 RNA backbone and rupture of hydrogen-bonding between complementary bases are gradual processes, the major portions of which occur above 40 °C. However, the unstacking of purine and pyrimidine bases is a more co-operative phenomenon occurring almost exclusively above 55 °C. © 1976.

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

10.1016/0022-2836(76)90076-0

✓ **نام ژورنال**:

Journal of Molecular Biology

✓ **سال انتشار**:

1976

✓ **کلیدواژه** (Keywords):

✓ **عنوان پژوهش**:

Studies of virus structure by laser-Raman spectroscopy. 3. Turnip yellow mosaic virus

✓ **نویسندگان**:

Turano T.A., Hartman K.A., Thomas Jr. G.J.

✓ **خلاصه پژوهش**:

Laser-excited Raman spectra of a plant virus, the turnip yellow mosaic virus (TYMV), reveal vibrational frequencies characteristic of both the nucleic acid (RNA) and coat-protein components. The prominent Raman lines of the virus were assigned to specific subgroups of the constituent macromolecules and were examined as a function of temperature for both H2O and D2O solutions. The Raman data indicate the following structural features of aqueous TYMV. Amide I and III frequencies of the coat-protein molecules exclude the presence of appreciable amounts of both α-helical and antiparallel-β-sheet structures and suggest that the polypeptide chain is mostly in an irregular conformation. All of the four cysteine residues of the coat-protein molecule have SH groups and no S-S linkages exist in TYMV. All SH groups are accessible to the solvent, as evidenced by their deuterium exchange. A tentative finding is that many or all of the carboxyl groups of aspartic and glutamic acid residues in the coat protein are ionized at pH 7. Tryptophan residues are exposed to solvent H2O molecules, whereas tyrosine residues are apparently not in contact with the solvent and form strong hydrogen bonds between the tyrosyl -OH donor and negative acceptor groups within the virion. These structural properties of TYMV are unchanged over the temperature range 0-54°C, above which the virus structure collapses. The encapsulated RNA molecule of TYMV contains an unusually low amount of ordered secondary structure (~60%), in comparison with those other single-stranded RNA species which have been studied (~85%). The secondary structure of encapsulated RNA is also largely resistant to changes in temperature up to 54°C. The cytosine residues of TYMV RNA are not protonated at pH 7, either for protein-free RNA or for RNA encapsulated within the virus. It is therefore unlikely that specific hydrogen bonding interaction between cytosine residues of RNA and carboxyl groups of coat proteins are a major source of stabilization of the native TYMV virion, at pH 7.

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

10.1021/j100552a008

✓ **نام ژورنال**:

Journal of Physical Chemistry

✓ **سال انتشار**:

1976

✓ **کلیدواژه** (Keywords):

✓ **عنوان پژوهش**:

RAMAN SPECTROSCOPY AND VIRUS RESEARCH.

✓ **نویسندگان**:

Thomas Jr. George J.

✓ **خلاصه پژوهش**:

A survey is given of developments leading to the application of laser-Raman spectroscopy in structural studies of viruses and model nucleoproteins. The major constituents of viruses - nucleic acid and protein molecules - exhibit Raman spectra which differ greatly from one another, both in the spectral ranges that contain vibrational frequencies of conformational interest and in the relative intensities of Raman scattering of their respective subgroups. These features, not common to the infrared spectra, allow laser-Raman spectroscopy to be exploited for the study of viral assembly and nucleoprotein interactions. Examples considered here are the RNA-containing virus MS2, and DNA-containing viruses Pfl and fd, and the complex of polylysine with DNA.

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

10.1366/000370276774456912

✓ **نام ژورنال**:

Applied Spectroscopy

✓ **سال انتشار**:

1976

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Anomalous side chain amidation in plasma membrane proteins of simian virus 40-transformed lymphocytes indicated by isoelectric focussing and laser raman spectroscopy

✓ **نویسندگان**:

Schmidt-Ullrich R., Verma S.P., Wallach D.F.H.

✓ **خلاصه پژوهش**:

Plasma membranes isolated from normal hamster lymphocytes and lymphoid cells transformed by SV401 1 Abbreviation: SV40 - simian virus 40. have been compared. Isoelectric focussing in 1% Triton X-100 8M urea reveals higher isoelectric points than normal for the non-glycosylated proteins in the membranes of transformed cells. This suggests greater amidation of membrane aspartates and/or glutamates. The focussing patterns also reveal a shift to lower pH for the isoelectric points of most glycosylated proteins suggesting increased silalylation. The Amide I - Amide II laser Raman spectra of the two membrane categories are consistent with greater side chain amidation in the membranes of neoplastic lymphocytes. © 1975.

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

10.1016/0006-291X(75)90782-2

✓ **نام ژورنال**:

Biochemical and Biophysical Research Communications

✓ **سال انتشار**:

1975

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely

✓ **عنوان پژوهش**:

Studies of virus structure by Raman spectroscopy I. R17 virus and R17 RNA

✓ **نویسندگان**:

Hartman K.A., Clayton N., Thomas Jr. G.J.

✓ **خلاصه پژوهش**:

The laser-excited Raman spectrum of the RNA virus, R17, is shown to contain a large number of Raman lines assignable to scattering by vibrations of the nucleotide residues of RNA and the amino-acid residues of protein capsomers. The Raman lines from specific nucleotide vibrations in the phage are compared with their counterparts in the spectrum of protein-free RNA to suggest many similarities of RNA structure in the phage and protein-free states. However, the average configuration of guanine residues in the phage is apparently very different from that of protein-free RNA, suggesting that guanine plays an important role in RNA-protein interactions. © 1973.

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

10.1016/0006-291X(73)91336-3

✓ **نام ژورنال**:

Biochemical and Biophysical Research Communications

✓ **سال انتشار**:

1973

✓ **کلیدواژه** (Keywords):

TEKSAN
Detect Precisely