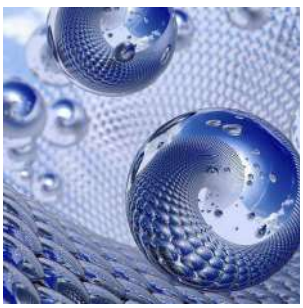
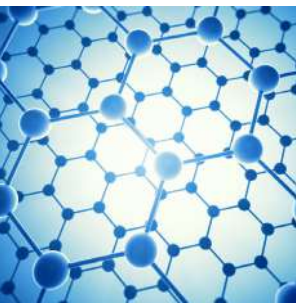
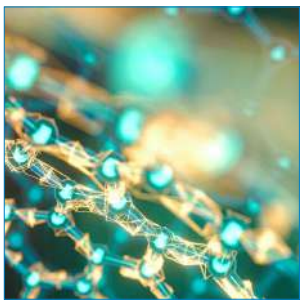
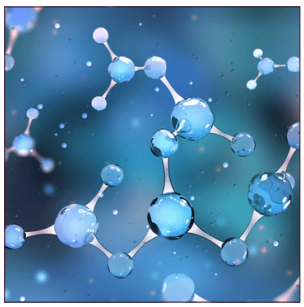
Scientific Tracks & Sessions
January 13, 2022

Nanomaterials Congress 2022



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Design and Synthesis of Novel Zeolite Nanocomposite adsorbent CuO/$ZnFe_2O_4$/NaA for inactivation of nerve agent sarin simulator

Pourya Zarshenas
Shahid Beheshti University, Iran

The aim of present research is to evaluate the decontamination of nerve agent sarin simulant dimethyl methyl phosphonate (DMMP) in water media using the CuO/$ZnFe_2O_4$/NaA zeolite as a novel ternary nanocomposite adsorbent. In this regard, the CuO and ZnFe2O4 nanoparticles were successfully synthesized within the NaA zeolite applying the ultrasound-assisted hydrothermal route and characterized via XRD, FESEM, FTIR, EDAX, VSM and BET analyses. Then, the CuO/$ZnFe_2O_4$/NaA nanocomposite activity was investigated for the decontamination of DMMP molecule and monitored by a GC-FID and GC-MS analyses. Plus, the impacts of several parameters, including contact time, adsorbent dose and adsorbent type on the decontamination of DMMP were studied. The gained data from GC-FID analysis confirmed the maximum decontamination more than 98.4% for DMMP. The parameters including: adsorbent amount of 50 mg and contact time of 40 min were achieved as the optimized values for the decontamination reaction. In addition, the non-toxic methyl phosphoric acid (MPA) as the DMMP degradation product in the presence of CuO/$ZnFe_2O_4$/NaA adsorbent was characterized.

Speaker Biography

Pourya Zarshenas was born in 1994, Tehran-Iran. He started B.Sc in 2013 at Shahid Beheshti University. He finished B.Sc in 2018. Immediately he Started M.Sc in 2018 at Shahid Beheshti University in Inorganic chemistry. He finished his Master in 2020. His thesis title is: "Design & identification of polymer nanocomposite as an eye sensor for toxic metal ions such as mercury, lead, etc. in aqueous media". He wants continue his academic education in Inorganic chemistry, crystal engineering & Polymer Chemistry.Master of Inorganic Chemistry from Shahid Beheshti Universiy (SBU) and Master of Polymer Chemistry from Azad University(IAU): Excellent command of the English language, including oral and written comprehension skills.Interested in education, research and executive affairs; With different and small experiences at the university and private companies. With a history of participating in more than 65 national and foreign specialized courses, attending 83 national and international scientific conferences, writing 108 scientific articles (105 conferences and 3 journals), Active participation in 56 scientific, industrial & academic projects, 21 specialized scientific books, winner 12 national and international awards & membership in 30 scientific associations.

e: dr.pouryazarshenas@yahoo.com

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Surface-enhanced Raman Scattering Bioprobes for Cancer Detection and Imaging

Aiguo Wu
Chinese Academy of Sciences, China

Surface-enhanced Raman scattering (SERS) technology with features of high sensitivity, selective enhancement, in situ detection, nondestructive, label free, and fingerprint spectrum has been widely utilized in various practical applications, especially for bioanalysis. Cancer diagnosis and therapy based on SERS biodetection and bioimaging have been reported as a promising approach during recent decades, and various types of materials-based SERS bioprobes are rapidly designed continuously. SERS biodetection and bioimaging has been successfully employed in cancer screening, diagnosis, and componential analysis in both *in vitro* and *in vivo* cancer tissue samples, which simultaneously provides visual morphology and biochemical information. Precise tumor tissue excision, real-time monitoring of cellular uptake process, and noninvasive cell tracking and labeling are realized due to the effective Raman image bioprobes, satisfying the requirements of precision medicine. In this talk, we will present our new progress in SERS bioimaging for cancer detection and imaging diagnosis based on various metal oxide nanoparticles and metal nanoparticles, particularly in circulating tumor cells (CTCs) in different types of cancers.

Speaker Biography

Aiguo Wu received his PhD from the Chinese Academy of Sciences supervised by Prof. Erkang Wang and Prof. Zhuang Li in China in 2003. He stayed at the University of Marburg (Prof. Norbert Hampp group) in Germany during 2004–2005, Caltech (Prof. Ahmed Zewail group) in USA during 2005–2006, and Northwestern University (Prof. Gayle Woloschak group) in USA during 2006–2009. In 2009, he joined NIMTE, CAS as a PI. He has published over 239 peer-review papers, H-index = 58, four books, and nine book chapters and has been awarded 73 invention patents. His lab focuses on using nanoprobes for early diagnosis and therapy of diseases and so forth.

e: aiguo@nimte.ac.cn

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Structural and Magnetic Properties Analysis of Trivalent Al^{3+} - Doped Ni-Zn-Co Nano-Spinel Ferrites

Nusrat Jahan
Jahangirnagar University, Bangladesh

The present study explored the structural, morphological, optical, and magnetic properties of $Ni_{0.4}Zn_{0.35}Co_{0.25}Fe_{2-x}AlxO_4(0\leq x\leq 0.12)$ nano-spinel ferrites. Thermogravimetric analysis and differential scanning calorimetry (TGA-DSC) determined nanocrystalline cubic structure formation. Single-phase cubic spinel structures with Fd3m space group of synthesized samples confirmed by Rietveld refinement X-ray diffraction (XRD) data. The particle sizes ranged from 6.7 nm-5.25 nm, and agglomeration occurred inside the ferrite samples. The atomic planes and strong crystallinity were detected through selected area electron diffraction (SAED) images. The existence of metal-oxygen (M-O) bonding was identified by the Raman spectra' characteristic peaks inside the sub-lattices. The optical bandgaps (E_g) were found 2.1 eV–2.52 eV for all the samples. Superparamagnetic natures of the nano samples were conformed through the S-shape hysteresis(M -H) loops. The studies' outcomes indicated the applicability for biomedical applications of these nano samples.

Speaker Biography

Nusrat Jahan is a PhD student in the Department of Physics, Jahangirnagar University. She is conducting her PhD research in Material Science and Nanotechnology. She was completed her MSc and BSc from the University of Dhaka. She is working at the American International University Bangladesh as an Assistant Professor. She published three articles from her PhD research in three International peers reviewed journals. She is a member of the American Chemical Society (ACS).

e: nusrat1974@yahoo.co.uk

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Synthesis of Two-Dimensional Transition-Metal Dichalcogenides by Mist Chemical Vapor Deposition for Field-Effect Transistors

Abdul Kuddus
Saitama University, Japan

Atomic layer two-dimensional transition-metal dichalcogenides (TMDs) have been attracted considerable interest owing to their strange properties together with unique structures that offers a wide range of applications in electronics, optoelectronics, photosensor, catalysis, spintronics and so on. The 2D-MoS_2 and WS_2 show the atomic scale thicknesses, free dangling bonds, higher chemical stability and a tunable band gap of ~1- 2 eV. In this work, synthesis of MoS_2, WS_2 and $WS_{1-x}S_{ex}$ on He-plasma treated $Al_{1-x}Ti_xOy$ has been investigated systematically by sequential Mist-Chemical Vapor Deposition (mist-CVD) and applied as channel layer of MOS-FETs. Ammonium tetrathiomolybdate $(NH_4)_2MoS_4$ and Ammonium tetrathiotungstate $(NH_4)_2WS_4$ were used as a precursor of MoS_2 and WS_2 respectively and N-methyl-2-pyrrolidone (NMP) as solvent. The prepared solution was supplied into the hot-wall reaction tube with Ar as generation and carrier gas containing H_2 (25%) at furnace temperature (Tf) of 400-600°C. Subsequently, the sulfurization (Selenization) was executed for further improving the quality of the MoS_2 or WS_2 ($WS_{1-x}S_{ex}$) flakes together with enhancing the crystallinity at Tf of 600°C for 20 min. Moreover, an efficient way of fabrication of atomic layer 2D TMDCs films with a comparable dimension is realized for the very first-time using mist-CVD with single precursor that can be applied as channel layer of MOS-FET.

Speaker Biography

Abdul Kuddus received his BSc. Engineering and MSc. Engineering in Applied Physics and Electronic Engineering from University of Rajshahi, Bangladesh in 2015 and 2016, respectively. He joined as PhD fellow in Shirai Lab, Saitama University, Japan in 2019 and continue till to date. He has over 30 publications in renowned journals that have been cited over 150 times and his current research focuses on developing a new solution-processed deposition approach Mist Chemical Vapor Deposition (mist CVD) for Two-dimensional metal dichalcogenides and their application in electronic and optoelectronic devices; MOS-FETs, Photodetector, solar cells.

e: kuddus4910@gmail.com

Variety of Glassy Nanocomposites: Transition from Ion hopping to Variable Range Polaron Hopping

Sanjib Bhattacharya
University of North Bengal, India

In recent days, Li2O doped glass-nanocomposites and their crystalline counterparts have been developed. Out of various rechargeable batteries, lithium is supposed to be one of the most promising candidates not only for its role inelectric vehicles, mobile computers etc, but also for academic interest. Some short-falls of conventional lithium-ion batteries have been already identified due to highly flammable nature of organic liquid electrolytes or polymer electrolytes. This safety issue may lead the researchers to develop "solid electrolytes" as they exhibit high thermal stability, high energy density and better electrochemical stability. Experimental research on chalcogenide glassy systems also paid much attention because of their higher electrical conductivity at room temperature and large composition flexibility, which made them suitable candidates for rechargeable batteries. Transition metal ions doped chalcogenide glassy systems showed that the electrical conduction mechanism predominated by hoping of small polarons. To explore the conduction mechanism in chalcogenide semiconductors, the study of frequency dependent electrical conductivity is very much essential not only for practical applications but also for academic interest. A complete description on electrical transport phenomenon and dielectric relaxation of such glassy system is still pending till date because of lack of their micro-structural information and approximation in data analysis.

Speaker Biography

Sanjib Bhattacharya completed his PhD in Jadavpur University, India and he is working as an Associate Professor and Deputy Director at the University of North Bengal, India. He is also a life member of the Indian Association for the Cultivation of Science, Neutron Scattering Society of India, Material Research Society of India. His research work has been acknowledged well and publish many paper in an journals.

e: sanjib_ssp@yahoo.co.in

Diminished Fluid Transport through Carbon Nanochannels Induced by COOH Functionalization: Implications for Nanofiltration and Oil Recovery

Verónica M Sánchez
INQUIMAE-CONICET, Argentina

Natural rocks, present in shale reservoirs, exhibit a nanoscale porous structure. In particular, the shale gas can be occluded in an organic nanoporous material called kerogen. In the oil industry, kerogen is characterized by its maturity, which is measured by its O / C ratio. In this line, we model kerogen material as carbon nanochannels (CN) with carboxylic groups (COOH) anchored on their inner surfaces. As discussed in the scientific literature, extraordinarily high flow rates have been obtained in CNs that cannot be predicted with standard macroscopic theories. In this work, we determine the effects of COOH of the inner surfaces of CN on fluid transport. We consider water and methane as representative cases of polar / non-polar fluids and also mixtures of them. We found a significant reduction in flow rates for all fluids due to geometric distortion associated with COOH functionalization. In particular for water, we observed not only a dramatic reduction in flow rates, but also structural changes in which the COOH groups act as nucleation centers for water droplets. Consequently, we determine that the flow rates depend on the CN O / C ratio, or in other words, on the maturity of the kerogen. We determined that the presence of a small amount of dispersed COOH groups helps to distribute the water molecules along the walls of the nanochannel, opening a path for the hydrocarbons to flow. Therefore, the relationship between rock permeability and maturity can provide a way to identify high conductivity zones for hydrocarbon recovery. Another application is the possible use of chemical additives to improve the flow of hydrocarbons in kerogen-rich rocks.

Speaker Biography

Verónica M Sánchez has completed her PhD at the age of 28 years from University of Buenos Aires, Argentina. She has been a postdoctoral fellow at the Nanochemistry Group at CNEA (National Entity of Atomic Energy), Argentina. She completed also a postdoctoral fellowship at the Nanopetro Research Group at Federal University of ABC, SP, Brazil. She is currently an associate researcher at Institute of Physical Chemistry, Environment and Energy (INQUIMAE) - CONICET (National Scientific and Technological Council). She is leading a research line on Computational Simulation of Physical Chemistry Processes of interest in Energy and Catalysis. She is a professor at School of Science and Technology at University of San Martin, Buenos Aires, Argentina. She has 17 publications that have been cited over 450 times, and her publication H-index is 12.

e: veronicasanchez210@gmail.com

Plasmonic Resonances and their Applications

Nilesh Kumar Pathak
University of Delhi, India

Plasmonic is the interaction of electromagnetic waves to the conduction electron of metal nanoparticle. Metallic nanoparticles supports surface plasmon resonances that can be tuned in desired range of electromagnetic spectrum. The tunability in plasmonic resonances highly depends on the morphology of chosen metallic particles. The motive of this most emerging branch of nanophotonics is to study and tune the surface plasmon resonances in different regimes of the electromagnetic spectrum that cover a broader range of applications. The various possibilities related to the size and shape of metal nanoparticles are analyzed to understand the physics of scattering, absorption, extinction, and surface plasmon resonances under the influence of the organic and inorganic surrounding environment that finds a variety of applications. To explore the plasmonic signature of metallic nanoparticles, a semianalytical as a well numerical approach has been used. In the semianalytical approach, the electrostatic approximation is used in which the Laplace equation has been solved to explain the electromagnetics of metal nanoparticles having different sizes and shapes. There are several numerical approaches like discrete dipole approximation (DDA), finite difference time domain (FDTD), COMSOL Multiphysics and boundary element method (BEM) have been used to explain the optics of complex metal nanostructures. In this study, the boundary element method is used to explain the surface plasmon resonances and electromagnetic field profile of metal nanoparticles.

Speaker Biography

Nilesh Kumar Pathak has completed his PhD from Indian Institute of Technology Delhi, India and postdoctoral studies from Science & Engineering Research Board (SERB)/University of Delhi, India. He was exchange fellow at EPFL Switzerland. He was Visiting Research Fellow in National Taiwan University (NTU) Taiwan. He is Assistant Professor in Department of Physics, Maharaja Agrasen College, University of Delhi since 2018. He is working in Computational plasmonics field to explain the electromagnetics of metallic nanogeometries. He has published more than 30 Research papers, 5 Book chapters 7 conference proceeding in reputed journals and has been serving as an editorial board member and reviewers of reputed journals like ACS Photonics, Scientific Report, Plasmonics, Nanoscale etc.

e: nileshpiitd@gmail.com

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Investigating Thermoelectric Properties of Yb_3Si_5 in a Wide Temperature Range for Low Temperature Thermoelectric Applications

Fahim Ahmed
University of Education Lahore, Pakistan

In this research we prepared Yb_3CoxSi_{5-x} where x=0, 0.1, 0.15, 0.20 and investigated their thermoelectric properties. Powder X-ray diffraction analysis confirmed all main peaks indexed to Yb_3Si_5 phase. Small amount of Si and Yb were observed as impurity. Thermal conductivity values are quite large for an ideal thermoelectric material, thereby maximum ZT value of 0.07 was measured at 300 K for non-doped Yb3Si5. A very large maximum power factor of ~ 4.70 mWm-1K -2 was observed at 72 K and room temperature value ~ 1.56 mWm-1K -2 for the pristine sample. These results shows that Yb-Si compounds have large potential to be used as low temperature TE applications in the future.

Speaker Biography

Fahim Ahmed a Professor at Department of Physics, Division of Science and Technology, University of Education Lahore, Pakistan. His research interests dealt with Thermal conductivity, Power factor, Nanomaterials, Thermoelectricity, particularly the development of Thermoelectric Properties incorporating nanomaterials.

e: Fahim.ahmed@ue.edu.pk

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