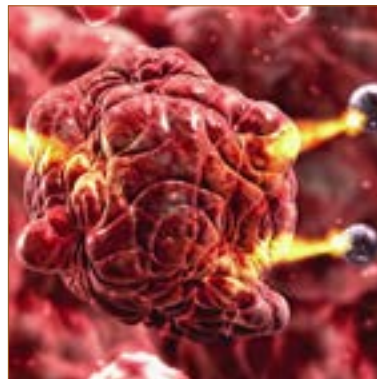
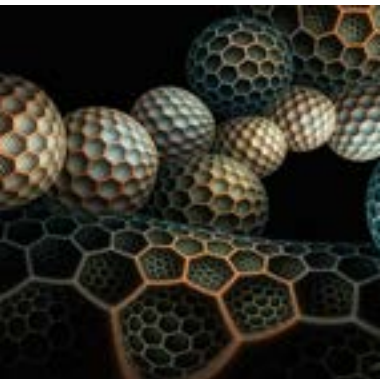

Poster Presentations

ICNST 2018



International Conference on

NANOSCIENCE & TECHNOLOGY

May 21-22, 2018 | New York, USA

Nanostructure of luminescent $Zn_kIn_{2O_{k+3}}$ materials

Julio Ramírez-Castellanos

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Several terms of the homologous series $Zn_kIn_{2O_{k+3}}$ ($3 \leq k \leq 13$) have been synthesized following solid-state reactions with an exhaustive control of the synthesis parameters. The structure consists of alternated layers of InO_2 - octahedral and wurtzite-like $InZn_kO_{k+1}$ blocks stacked perpendicular to the c -axis of the crystal, where zinc and indium occupy tetrahedral and trigonal bipyramid sites. Moreover, the zone axis show a gradual shift of the oxygen position in order to keep the polarization neutrality along c axis and allow the formation and stabilization of the structure, while no differences of the indium distribution inside the wurtzite blocks is visualized). On the other hand, images from zone axis show the characteristic nanostructured zig-zag modulation of this homologous series. Electron energy loss spectroscopy (EELS) confirms the preference site of In^{3+} along this zig

zag pattern. Cathodoluminescence measurements reveal a main emission band centered at 1.75 eV, which shows an increasing of intensity with k , and has been attributed to the existence of zinc vacancies. For this reason, the combined study of structural aspects and physical properties of these oxides, as addressed in this work, is necessary for a proper discussion of the results.

Speaker Biography

Julio Ramirez-Castellanos works in the synthesis and structural/microstructural characterizations of new functional inorganic materials by high-resolution electron microscopy. Currently, he is professor at Complutense University, Madrid. He is co-author of more than 100 reviewed scientific publications, 4 invention patents, and more than 100 communications to international conferences.

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 Notes:

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Simultaneous delivery of the protein and anti-Cancer drug for the treatment of bone cancer using ceramic-polymer hybrid nanoparticles

Ram Prasad S

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Delivery of multiple drugs has gained considerable attention in recent years especially for the repair and regeneration of hard tissue as in the case of bone tumors. Various kinds of ceramic nanoparticles (NPs) were studied as bone graft substituents and drug delivery vehicles. Among them calcium phosphate ceramic (CPC) NPs were much focused due to their unique advantages such as biocompatibility, bioactivity, affinity to biopolymers and high osteogenic potential. CPC forms the major mineral component of the bone and has been extensively used as a carrier for delivery of small molecules, growth factors and for tissue engineering and orthopedic applications. Local delivery of chemotherapeutic agents is preferred for the treatment of metastatic bone cancer in comparison with systemic administration. Co-delivery of a protein and an anti-cancer drug is a challenging approach in bone tissue engineering as well as drug delivery. Our current study focuses on developing model ceramic-polymer hybrid NPs for the treatment of bone cancer. Ceramic core with polymer corona hybrid NPs were fabricated and evaluated for the combined delivery of an anti-cancer drug and a protein. Hydroxyapatite NPs were loaded with model protein

bovine serum albumin (BSA) and subsequently coated with poly(vinyl alcohol)-methotrexate (MTX) conjugate. The synthesized hybrid NPs were extensively characterized by various techniques such as IR, XRD, NMR, TEM and TGA. The coating efficiency was found to be 10-17%. In vitro drug release performed in phosphate buffer for 2 weeks showed simultaneous release of both MTX (88%) and BSA (76%) in a sustained manner. Human osteosarcoma (OMG-63) cell line was used to check the cytotoxicity and cellular uptake of NPs. The NPs were biocompatible and exhibited anti-proliferative activity in a concentration-dependent manner. Moreover, the NPs showed excellent cellular uptake as confirmed by flow cytometry and fluorescence imaging.

Speaker Biography

Ram Prasad S received B. Pharmacy and M. Pharmacy degree from Madras Medical College, Chennai and currently doing PhD under the guidance of Prof. A. Jayakrishnan (Biotechnology) and Prof T.S. Sampath Kumar (Metallurgical and Materials Engineering) from Indian Institute of Technology Madras, Chennai, Tamilnadu, India. His current research is development of bone void filling materials composed of ceramic polymer hybrid nanoparticles for the delivery of therapeutic molecules.

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 Notes:

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Nano size BaFeO_{3-d} material: The role of oxygen non stoichiometry in the CO oxidation activity

Marina Parras

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The substitution of so-called critical elements, among which Noble Metals (NM) and some Rare Earths (RE) are included, has become a question of major concern to reach the goal of sustainable development. In the particular context of Heterogeneous Catalysis, the substitution of NM by Transition, mostly 3d, Metals, is an issue that has already received attention. In connection with this target, ABO₃ perovskite related oxides have been essayed as catalysts in a number of reactions, most of them redox processes. In particular, lanthanide based perovskites have been extensively studied as catalysts in the CO oxidation reaction. Total substitution of La by Ba fits perfectly with the actual demands to replace critical RE. BaFeO_{3-d} (0.2 < d < 0.4) depicts a 6H perovskite hexagonal structural type with Fe both in III and IV oxidation states and oxygen nonstoichiometry accommodated by random distribution of anionic vacancies. The decrease of the particle size dramatically decreases

the temperature of the reduction process of the sample. Actually, under soft conditions (T ≈ 200 °C/H₂), nano-BaFeO_{2.78} suffer an easy and reversible reduction process that occurs by a different pathway than that described for BaFeO_{3-δ} bulk material. This material proved to be more active than its lanthanide-based counterpart. The analysis of the structural and chemical aspects of the reduction process of nano-BaFeO_{2.78} makes possible to propose the role of the oxygen deficiency responsible for the CO oxidation activity of BaFeO_{3-δ}.

Speaker Biography

Marina Parras-Vazquez, full professor at Inorganic Chemistry Department in Complutense University of Madrid, currently works in the synthesis and structural/microstructural characterizations of new functional inorganic materials. She is co-author of more than 100 reviewed scientific publications and more than 100 communications to international conferences.

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SnO₂ and TiO₂ / graphene oxide composites for applications in Li-ion batteries

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Materials for lithium-ion battery (LIB) applications have become the topic for intensive research. Several oxide-based materials have been studied such as the graphitic carbons as anodes which are limited by a low theoretical capacity about 372 mAh·g⁻¹, and electrochemically active metal oxides CuO, SnO₂, Fe₃O₄ or Co₃O₄ with high theoretical capacities ~1000 mAh·g⁻¹. One disadvantage is a large volume expansion and particle agglomeration during the lithiation/delithiation processes that lead to rapid degradation of the battery. Herein, we report the study of SnO₂ and TiO₂ nanoparticles and their composites with graphene oxide (GO) for applications as anodes in Li-ion batteries. Two chemical routes were used for the synthesis of nanoparticles in order to check its stability and effectiveness. One is the sol-gel method and the other one is the hydrolysis

method. Capacity-cycle and capacity-voltage measurements have been performed in a coin cell type. SnO₂ batteries show a high capacity in the charge/discharge process up to 100 cycles; however, TiO₂ nanoparticles reveals a large stability in capacity terms up to 200 cycles, and finally an intermediate capacity for the GO/SnO₂ composite that remains stable still in the 200th cycle, that can be used as a promising alternative anode material for LIBs.

Speaker Biography

Julio Ramírez-Castellanos works in the synthesis and structural/microstructural characterizations of new functional inorganic materials by high-resolution electron microscopy. Currently, he is professor at Complutense University, Madrid. He is co-author of more than 100 reviewed scientific publications, 4 invention patents, and more than 100 communications to international conferences.

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Hydrocortisone acetate and sodium succinate liposomal preparations for ophthalmic application using microfluidics

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Liposomes are used in ophthalmic preparations to increase the corneal contact time and uptake of hydrophilic and hydrophobic APIs of ocular preparations. Microfluidic chips could be used as a continuous manufacturing process to produce nanoparticles. The aim of this experiment was to investigate the critical process and formulation factors in the liposomal preparation of hydrocortisone through microfluidic device. Three factors were investigated in this study: flow rate ratio (FRR), drug concentration (DC) and total lipid concentration (TLC). Liposomes particles size (PS), polydispersity (PDI) and drug entrapment efficiency (EE %) were selected as responses. Minitab software was used to construct a central composite design (CCD) to analyse the importance of these parameters. A microfluidic device (Y-

type, 2 inlets) was used to produce a liposomal formulation for ophthalmic application. Hydrocortisone Acetate (HCA) and sodium succinate (HSS) were used as a model drug to investigate the effect of drug hydrophilicity on liposomes size and encapsulation efficiency. Lecithin and cholesterol were used as lipid. The obtained results show the FRR of water/ alcohol was the significant factor for both drugs in term of PS, PDI and (EE %). TLC and DC have an effect in case of HCA but not in case of HSS. The Highest drug EE% is 65 % for HSS and 29% for HCA. The design space for the physical characteristics (CQA) of liposomes was determined successfully with respect to the intended use.

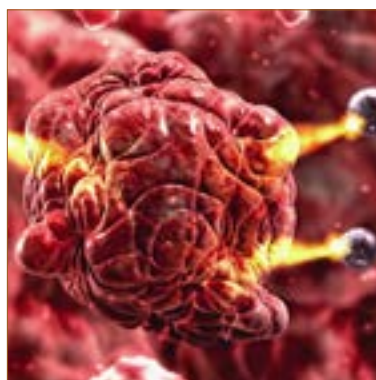
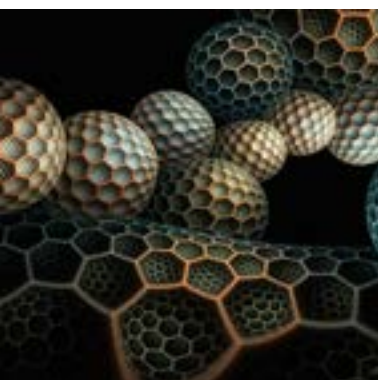
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Accepted Abstracts

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Preparation of Chitosan nanoparticles for growth improvement of fingermillet and protection against blast fungus

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The use of bio-based nanomaterials in agriculture is receiving more attention due to their non-toxicity, biodegradability, specificity and broad range of action with improved function. Chitosan, a polymer is used in agriculture for improved growth and protection of crops from various biotic stresses. However, the size limits its wide application and hence, chitosan nanoparticles were synthesized. Synthesized chitosan nanoparticles were characterized using FTIR, DLS, TEM and XRD analyses. They were used to improve growth and yield of fingermillet plants and to protect them

from phytopathogenic fungus. Foliar application of chitosan nanoparticle promotes growth of fingermillet plants and induced ROS accumulation, peroxidase activity in treated leaves. Treated plants challenged with blast fungus showed protection. High accumulation of peroxidase correlates with decreased blast disease symptom appearance in treated plants. Treated plants showed high accumulation of ROS and peroxidase which might be the reason for suppression of blast disease incidence.

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Perovskite and plasmonic nanostructures as key elements in advanced optoelectronics


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Plasmonics have been recognized as promising platform that may premise the enhanced performance of next-generation optoelectronic devices. Plasmonic effects have been proposed as a solution to overcome the limited light absorption of thin film photovoltaic devices and diverse types of plasmonic solar cells have been developed. Recently, we made a comprehensive overview of the state-of-the-art progress on the design and fabrication of plasmonic solar cells as well as the understanding of the enhancement mechanism. In this presentation, we propose a few strategies to develop viable plasmonic DSSCs and OPVs based on metal-graphene oxide core-shell nanostructures or lithographically-induced plasmonic nanopatterns. Very recently metal halide perovskites have been attractive as solar energy harvesters due to efficient ambipolar transport

and strong light absorption. They have rapidly advanced thin film photovoltaic performance; as a result, the observed instabilities urgently require a solution. We report the reduced-dimensionality (quasi-2D) perovskite films that exhibit improved stability in solar cell performance while retaining the high performance of conventional three-dimensional perovskites. The quasi-2D perovskites were also employed to develop limiting emitting diodes with the most bright and highest EQE. We provide an overview of the recent progress of perovskite-based photodetectors focusing on versatile compositions, structures, and morphologies of constituent materials, and diverse device architectures toward the superior performance metrics.

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Rubber nanocomposites with segregated network of multiwalled carbon nanotubes

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Segregated electrically conductive polymer nanocomposites (s-CPCs) have conductive fillers segregated at the interfaces of the polymer particles instead of being randomly dispersed in the polymer matrix. Rubber nanocomposites with segregated structure of Multiwalled carbon nanotubes (MWCNTs) have been prepared by latex technology. Natural rubber (NR) and Carboxylated acrylonitrile rubber (XNBR) are used as the polymer matrices and MWCNT is used as the conducting nanofiller. Surfactant assisted sonication has been done to get stable aqueous dispersions of MWCNTs. An alternate method without using surfactant includes the oxidation of nanotubes in acidic environment which make them hydrophilic and assists in forming stable dispersions in water. Latex stage mixing of the aqueous dispersions of

MWCNTs to the rubber followed by film casting resulted in composites with beautiful network of nanotubes inside rubber which has been confirmed from TEM images. Fracture surface morphologies as per SEM studies also support the segregated network inside both NR and XNBR. The composites exhibited good mechanical and solvent barrier properties. Very low percolation threshold obtained from electrical conductivity studies confirmed the segregated network structure in which individual CNTs are aligned along the periphery of the rubber particles in the composite. The composites exhibited excellent dielectric properties which make them promising in the capacitor applications.

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Comparison of phase transfer rates of three types of core-shell CdSe/Zns, Inp/Zns, CulnSe/ZnS quantum dots from organic-to-water phase


Dilem Marşan

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The amount of quantum dots released to various environmental media is likely to increase in parallel with the increase in their production and use. There is a need for more research on fate and transport of quantum dots in the environment. This study focused on phase transfer of three types of core-shell CdSe/ZnS, InP/ZnS, CuInSe/ZnS quantum dots from organic phase (toluene/hexane (1:2) to water phase. The effect of Natural Organic Matter (NOM, humic acid concentrations of 5- 10- 20- 50-100 ppm) and

ionic strength (0.01M, 0.02M, 0.03M KCl) on phase transfer rate were investigated. Phase transfer was characterized by multiple techniques including infrared and UV/Vis absorption spectroscopy, electron microscopy, FTIR spectroscopy and ICP-MS. This study aims to advance our understanding on destabilization and transport of quantum dots that have varying elemental composition for design for environment.

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New carbon allotropes, their synthesis, properties and applications


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The structural, mechanical, physical, and chemical properties of recently discovered and developed nanocarbon allotropes are discussed. These nanostructures include nanotori, nanobuds, graphene and its derivatives: graphene nanoribbons, graphyne, graphdiyne, graphone, and graphane. Graphyne and graphdiyne (2D carbon allotropes on graphene basis having honeycomb structures), graphone and graphane (hydrogenated graphene derivatives) are currently less-known and will be examined in detail. The

synthesis of all these materials, their existing and potential applications in nanotechnology and materials chemistry and physics are examined. These carbon allotropes are promising for next generation of flexible electronics, nanoelectronics and spintronics, as well as ITO substituents, sensors, lubricants, gas storage media, in biomedicine and catalysis, among many other applications.

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 Notes:

Doped and defective three phase TiO_2 Hetrojunctions for enhanced H_2 generation by solar water splitting

Tom Mathews

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Hydrogen as a fuel from renewable energy resources has drawn immense attention recently. Among the various methods of H_2 production, sun light assisted water splitting using TiO_2 catalyst is of high interest. The two major intrinsic issues with TiO_2 are high electron-hole pair recombination and absence of visible light absorption. An effective strategy to inhibit the charge recombination is generation of heterojunctions formed by various TiO_2 phases. Among the various modifications adopted for making TiO_2 visible light active, nitrogen doping and native defect creation are the widely recognized ones. Hence smooth charge transfer pathways for effective charge separation with tuned band gap for visible light absorption, can be achieved by having large number of three phase heterojunctions modified with nitrogen doping and or native defects. The main drawback with doping is that the dopants have the high probability to act as recombination centres. Hence modification of titania to make it visible light active without external doping is appreciated. In this regard, band gap tuning of triphase TiO_2 with native defects is of interest. Although there are reports on H_2 generation using biphasic TiO_2 , studies on facile methods for the synthesis of tunable TiO_2 heterojunctions of pristine, nitrogen doped and native defects are still under progress. Herein, we report a

novel synthesis method to prepare pristine, N-doped and oxygen deficient TiO_2 nanotubes having anatase-rutile, rutile-brookite, anatase-brookite and anatase-rutile-brookite heterojunctions by simple tuning of applied voltage in a novel electrochemical anodization technique, as well as their application in H_2 generation by water photolysis. The synthesized triphase TiO_2 nanotubes are found to be 1.6 times efficient than that of biphasic nanotubes and 2.5 times that of single phase nanotubes. Similarly, the nitrogen doped anatase-rutile-brookite heterojunctions shows 7.5 times hydrogen generation efficiency than that of triphase TiO_2 nanotubes. The water splitting efficiency of triphase heterojunctions with native defects is found to be 16 times that of pristine triphase TiO_2 heterojunctions. In addition, the charge transfer characteristics to determine the underlying physics behind the high efficiency of such systems will be presented. A band diagram is proposed for pristine and modified triphase heterojunctions with the possible electron transfer pathway using synchrotron valence band edge analysis. It is found that the photoexcited charge transfer takes place from rutile to anatase to brookite in triphase TiO_2 nanotubes.

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Uniform corrosion behavior of aluminium composites reinforced with nanoclay / MWCNT


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AA 5083 are the widely used aluminium alloy materials for marine, offshore, structural, aerospace and automobile applications due to strength to weight ratio and resistance to corrosion. Further, to improve the life span of the material with increased mechanical and corrosion resistance property of the material Montmorillonite -MMT (Nanoclay) and Multi-wall Carbon Nanotube (MWCNT) was used by varying compositions like 3, 5, 7 and 9 by percentage weight and 1, 1.25, 1.5 and 1.75 by percentage weight to improve the corrosion behavior of the Aluminium Metal Matrix Composite (AMMC). By using compo-casting process the

AMMC was developed. The developed composites surface morphology was studied using Scanning Electron Microscope (SEM) and Field-Emission Scanning Electron Microscope (FESEM). The tensile tests were carried out based on the ASTM standard A370, to find the mechanical property of the developed composite materials. According to the ASTM-G31, uniform corrosion tests were carried out for the developed composites in HCl solutions. AA 5083 with MWCNT shows the better mechanical and corrosion resistance property than Nanoclay.

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 Notes:

Improved room temperature ferromagnetism in Ni doped SnO₂ nanoparticles: A detailed study


Tripathi P

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In this talk we emphasized on a detailed investigation of the structural, optical, and magnetic properties of pure and Ni-doped SnO₂ nanoparticles (NPs) synthesized by a sol-gel process. An extensive structural study has been carried out using various characterization techniques. The X-ray Diffraction (XRD) spectra show the formation of the single phase tetragonal structure of pure and Ni-doped SnO₂ NPs without any noticeable impurity phase such as NiO. XRD results reveals that the crystallite size of SnO₂ is found to be decreased with Ni doping, which has also been confirmed by the Field Emission Scanning Electron Microscopy study. X-ray Photoelectron Spectroscopy (XPS) measurements displayed a clear sign for Ni²⁺ ions occupying the lattice sites of Sn⁴⁺ in the SnO₂ host which also gives clear evidence for the formation of single phase Sn_{1-x}Ni_xO₂ NPs. The optical analysis shows

a significant decrease in the energy gap of SnO₂, (i.e., from 3.71 eV to 3.28 eV) as Ni concentration increases which may be correlated with the core level valence band XPS analysis. Photoluminescence studies show that Ni doping creates oxygen vacancies due to dissimilar ionic radii of Ni²⁺ and Sn⁴⁺. Superconducting quantum interference device measurements revealed that the Ni doped SnO₂ NPs exhibit strong ferromagnetic behavior at room temperature and this analysis has been well fitted with a simple relationship to find out magnetic parameters proposed by Stearns and Cheng et al. Hence, our results demonstrate that Ni-doping has strong impact on the structural, optical, and magnetic properties.

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 Notes:

Microwave assisted hybridization of Ternary selenides with TiO_2 for enhancement in Photocatalytic degradation efficiency against Methylene Blue (MB)

Anuraj Kshirsagar

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III-VI family ternary chalcogenides e.g. CuInSe_2 (CISE), AgInSe_2 (AISE), CuSbSe_2 (CSbSe) etc. have attracted attention because of properties such as, high absorption coefficient, high photo stability and high solar cell conversion efficiency. Ternary selenides have extensively studied for various important energy applications such as, solar cells, photonics and other electronic devices. However, there is need to explore some other areas where such semiconductors can be effectively employed. The NIR absorption and small band gap of ternary selenides has potential as photocatalyst thus making them technologically more important. Ternary chalcogenides are not so much explored as photocatalyst for degradation of dyes. Present study therefore highlights the use of hybridized ternary selenide/ TiO_2 nanostructured materials as photocatalyst against Methylene blue (MB) under long UV light (365 nm). Microwave method was

used for effective coupling between spherical CISE/AISE/CSSE nanoparticles (NPs) and anatase TiO_2 NPs. The hybrid photocatalysts were characterized by various advanced analytical tools such as, UV-Visible spectroscopy, XRD, TEM etc. The X-ray diffractions of hybrid nanomaterials revealed effective hybridization while TEM showed surface modification due to accumulation of TiO_2 NPs over ternary selenide NPs. The degradation of MB revealed maximum efficiency of about ~89% for AISE/ TiO_2 . The degradation efficiency as well as degradation rate constant were found to be significantly enhanced as compared to TiO_2 and parent ternary selenides alone. The different intermediates were identified by HPLC/MS which suggests formation of environmental friendly oxidized products.

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Synthesis of biopolymer based platinum nanoparticles And 5-fluorouracil loaded Platinum nanoparticles and evaluation of their anti-tumor potential employing Potato Tumor Bioassay model


Godugu Deepika

Osmania University, India

A facile and green synthesis of platinum nanoparticles (GKPtNP) using biopolymer, Gum Kondagogu (GK) as a reducing, capping and stabilizing agent was developed. The formation and stability of GKPtNP was confirmed by UV-visible spectroscopy, SEM-EDAX, TEM, XRD, Zeta potential analysis, FTIR, ICP-MS and stability studies. The formed GKPtNP are well dispersed, homogenous and showed a characteristic absorption peak at 201 nm, with a size of $2-4 \pm 0.50$ nm and recorded negative zeta potential (-46.1 mV) indicating good stability. 5-fluorouracil (5FU), a known anticancer drug, was loaded into the synthesized GKPtNP, which leads to the development of a new combination of nanomedicine (5FU-GKPtNP). The in vitro drug release studies of 5FU-GKPtNP in pH 7.4 showed a sustained release profile over a period of 120 mins, and the hemolysis studies revealed that GKPtNP, 5FU and 5FU-GKPtNP were found

to be blood compatible. *A. tumefaciens* induced in vitro potato tumor bioassay was employed for screening the anti-tumor potentials of GKPtNP, 5FU and 5FU-GKPtNP. The experimental results suggested, a complete tumor inhibition by 5FU-GKPtNP at a lower concentration than the GKPtNP and 5FU respectively. Further, the mechanism of antitumor activity was confirmed by their interactions with DNA using gel electrophoresis and UV-spectroscopic analysis. The electrophoresis results revealed that the 5FU-GKPtNP totally diminishes DNA and the UV-spectroscopic analysis showed hyperchromic effect with red shift indicating intercalation type of binding with DNA. Over all, the present study revealed that the combined exposure of the nanoformulation (5FU-GKPtNP) resulted in the enhanced antitumor effect on *A. tumefaciens* induced potato tumor bioassay.

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