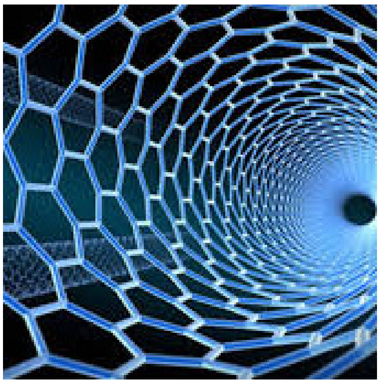
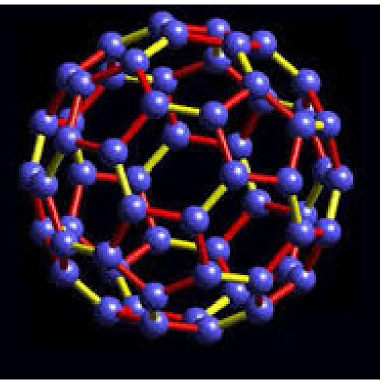
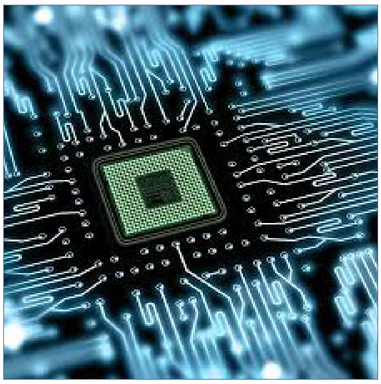
Keynote Forum
August 20, 2018

Materials Chemistry 2018







International Conference on

Materials Science and Materials Chemistry

August 20-21, 2018 | Paris, France

Maria Tomoaia-Cotisel

Babes-Bolyai University of Cluj-Napoca, Romania

Advanced nanostructured materials: Turning scientific discoveries into health

Advanced multi-functional ceramics, like nano hydroxyapatites containing Mg, Zn, Sr and Si within hydroxyapatite (HAP) lattice, noted HAP-Mg-Zn-Sr-Si, are of a major interest for hard tissue engineering and biomedical applications, particularly due to their similarity with biological HAP from bone structure. Among the innovative strategies, the ionic substitution represents an intelligent tool to improve the biological efficiency of nanobiomaterials based on HAP, as a new generation of advanced bioceramics based on multi-substituted hydroxyapatites, ms-HAPs. Series of these advanced ceramics were synthesized in our Physical Chemistry Center by innovative strategies, including wet chemical precipitation method, without surfactants or template molecules, by thermal processing, lyophilisation and calcination. Thus, nano ms-HAPs, containing divalent cations of Mg, Zn and Sr, as well as with Si as orthosilicate, were synthesized and thoroughly characterized. Particle size, crystallinity, morphology, specific surface area of obtained advanced multi-functional bioceramics were investigated by XRD, ICP-OES, SEM-EDX, FT-IR and FT-Raman spectra, HR-TEM, AFM and BET measurements. The obtained data confirmed a unique nanostructured phase of the highest compositional purity for all synthesized biomaterials. Results also showed a distinct change in shape and size of nanoparticles, and in crystallinity of lyophilized powders, non-calcined or calcined, with ionic substitutions. The substitution effect on biological performance of these bioceramics was investigated on primary human osteoblasts in culture media. Therefore, innovative scaffolds were fabricated by supramolecular engineering approach from advanced HAP-Mg-Zn-Si and HAP-Mg-Zn-Sr-Si bioceramics self-assembled alone or with collagen: COL on solid/liquid interface. Human osteoblasts response on doped HAPs was assessed by viability tests, like MTT assay, adhesion and proliferation, and protein expression for osteoblast markers, such as collagen type 1, osteopontin, osteonectin and osteocalcin. Moreover, the investigation of alkaline phosphatase activity and F-actin stress fibers indicated the highest biological performance for advanced functional bioceramics compared with pure HAP scaffolds, particularly in promoting the formation of mineralized bone matrix. The enhanced biological performance of these advanced nanomaterials recommends them for medical applications, as bioactive coatings for smart orthopaedic and dental implants and as bone substitute for bone repair and regeneration. Certainly, these results demonstrate benefits of turning these discoveries into health, with multiple uses in clinical applications for bone tissue repair and regeneration as well as in the treatment of osteoporotic bone fractures. Consequently, multi-substituted hydroxyapatites can be a promising multi-functional bioceramic platform for nanomedicine applications.

Speaker Biography

Maria Tomoaia-Cotisel completed Ph.D. at the Babes-Bolyai University of Cluj-Napoca, Romania, and postdoctoral studies from London University, King's College, UK. She is a corresponding member of the Academy of Romanian Scientists. She was the visiting scientist at Philipps University of Marburg, (1989/1990), Germany, State University of New York at Buffalo (1990/1991), US, National Institutes of Health, (1991-1993) and Molecular/Structural Biotech., Inc., (1994-1997), Bethesda, MD, USA. She is the founder and director of Research Center in Physical Chemistry (2007-) at BBU, STAR research institute. She published over 250 original research papers, 5 patents, and 10 books in physical chemistry, including thermodynamics, chemical structure, biophysics, bionanomaterials, colloids, and interfaces. She got important awards, e.g., Gheorghe Spacu Award (1983, from the Academy in Romania), Alexander von Humboldt Award (1986, Germany), Japan Society for Promotion of Science and Technology Award (1986, Japan) and Fogarty Award (1991, USA) for science and technology. She is a leader and supervisor for Ph. D. students in Doctoral School of Chemistry at BBU, in physical chemistry, biophysics and material science.

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Sumit Kumar Gupta

Parishkar College of Global Excellence, India

Review of high temperature superconductors and application in various fields

The layered perovskite cuprate materials are a unique class of superconductors with unusual normal-state and superconducting properties. The common physics of all these materials is that of the underlying CuO2 planes. This review provides a survey of and guides to their physical properties as it relates to the superconductivity of this interesting group of conducting oxides. The present statuses on applications of cuprate-based high-temperature superconductors have been included. All characteristics of cuprate-based superconductors depending upon the recent discoveries and applications of those compounds have been included and explained in this article so that a researcher can get a good idea about this field.

Speaker Biography

Sumit Kumar Gupta is the dean of the faculty of Science department, Parishkar College of Global Excellence, India. In the department of physics with over 15 years of teaching, research, and administrative experience he has held various administrative positions. He has published 23 research papers in highly reputed UGC approved international journals. He had participated in 14 National and International Seminars and delivered over 19 lectures in the international and national conferences. He has been selected as a keynote Speaker in 3 International Conferences in material science 2017, London, Dubai and USA. He has written 7 books in engineering. He has been appointed as an editorial board member in UGC approved 41 international journals.

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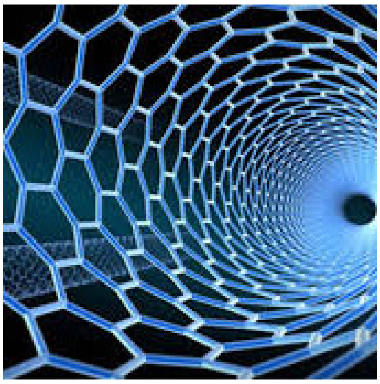

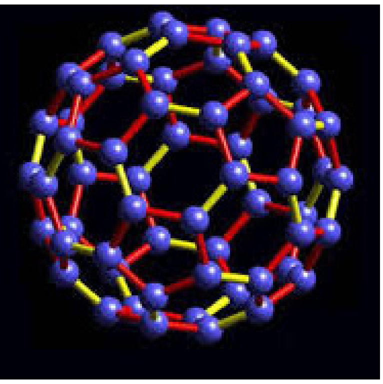

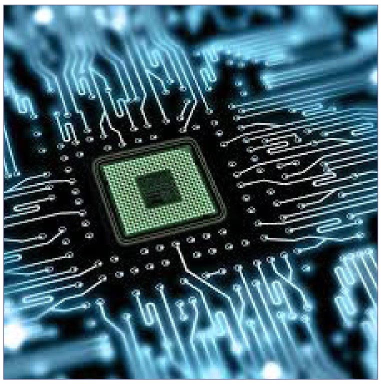

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Yan Huang

Brunel University, UK

Material selection, fabrication and characterization of magnesium matrix particulate nanocomposites for biomedical applications

Magnesium alloys have a similar mechanical strength and elastic modulus to those of human bones and are dissolvable in the physiological environment, representing a new generation of biomaterials for orthopaedic and cardiovascular applications. However, the alloys lack adequate strength and corrosion resistance as the implant material. The present work was carried out to develop an optimum route for fabricating magnesium matrix particulate nanocomposites with controllable strength and degradability. The matrix alloy was selected with cytotoxicity free alloying elements and minimum amount of second-phase particles. The reinforcing particles including biocompatible hydroxyapatite (HA), beta-tricalcium phosphate and magnesium oxide (MgO) were chosen to improve strength and corrosion resistance. The composites were fabricated by combined high shear solidification (HSS) and severe plastic deformation via equal channel angular extrusion (ECAE) or conventional extrusion. The cast nanocomposites obtained by HSS showed a fine and equiaxed grain structure with the globally uniform distribution of nanoparticles, although HA showed the best wetting effect. Both ECAE and conventional extrusion at 350°C resulted in further microstructural refinement and the improvement of particle distribution, but the latter led to a finer grain structure. The microstructure and particle distribution in the as-cast state and after deformation processing were characterized by optical and electron microscopy, EDS and XRD, etc. The mechanical properties were tested by compression and electrochemical performance was assessed by static polarization tests. Corrosion behaviour was studied by immersion tests and electrical impedance analysis. The detailed experimental results are presented in this paper together with discussions on the benefits of both HSS and ECAE and the mechanisms responsible for the enhanced materials performance.

Speaker Biography

Yan Huang leads metallic biomaterials research at Brunel, working on both traditional permanent titanium implants and novel biodegradable magnesium medical devices for orthopaedic cardiovascular applications. He recently won three research grants in biomaterials research from the Royal Society, EPSRC and European Commission. Huang is a founding member and co-investigator of the EPSRC Future Liquid Metal Engineering (LiME) HUB where he leads the activities on process development and light alloy processing involving both solidification and plastic deformation. He has extensive experience in process innovation for combined solidification and thermomechanical processing (semisolid forming, twin roll casting, and integrated cast-forming), solid state joining, severe plastic deformation for light alloys and light metal matrix composites. He has long-term interests in the characterization of microstructure and texture evolution during thermomechanical processing and fundamental issues of strengthening, plastic deformation and grain boundary migration.

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Mineo Hiramatsu

Meijo University, Japan

Synthesis of vertical graphene network and its emerging applications

Graphene (monolayer and few layers) is a two-dimensional material with the large anisotropy between in-plane and out-of-plane directions. Carbon nanowalls (CNWs) are layered graphene with open boundaries, standing vertically on a substrate to form a self-supported network of maze like-wall structures. This kind of carbon nanostructure is also called carbon nanoflake, carbon nanosheet, graphene nanosheet, and graphene nanowall. CNWs are sometimes decorated with metal nanoparticles and biomolecules. The structure of conductive CNWs with a large surface area, combined with surface decoration, would be suitable for the platform in electrochemical and biosensing applications. CNWs and similar vertical graphene structures can be synthesized by plasma enhanced chemical vapour deposition (PECVD) techniques on heated substrates (600-800˚C) employing methane and hydrogen mixtures. Control of CNW structures including spacing between adjacent nanowalls and crystallinity is significant for the practical applications. Moreover, surface functionalization including surface termination and decoration with catalytic metal nanoparticles should be established. We report the current status of fabrication and structure control of CNWs. Moreover, the CNW surface was decorated with Pt nanoparticles by the reduction of chloroplatinic acid or by the metal-organic chemical deposition employing supercritical fluid. We also report the performances of hydrogen peroxide sensor and fuel cell, where CNW electrode was used.

Speaker Biography

Mineo Hiramatsu is a Full Professor of Department of Electrical and Electronic Engineering and the Director of Research Institute, Meijo University, Japan. His main fields of research are plasma diagnostics and plasma processing for the synthesis of thin films and nanostructured materials. He is an author of more than 100 scientific papers and patents on plasma processes for materials science and a Japan Society of Applied Physics Fellow.

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