ASET2023

Global Meet on

Applied Science, Engineering and Technology

23-24 November, 2023

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About ASET2023

We are delighted to invite you to the Global Meet on Applied science, Engineering, and Technology (ASET2023)'', on November 23-24, 2023 which will be organized by the science wide meetings organization.

The conference has an overall goal of Making Connections, with major scientific themes of recent trends in Knowledge Engineering, Applied Mathematics, Computational Fluid Dynamics, Artificial Intelligent, Civil Engineering, Material Science Engineering, Chemical Engineering and Nanotechnology and Smart Materials. In addition, the conference will provide a number of networking opportunities to help establish connections for early Applied Science scientists and AI scientists across the globe.

The conference will be focused on several fields of application, operation and influence of the applied sciences and technologies on industry.

We’re looking forward to an excellent meeting with scientists from different countries around the world and sharing new and exciting results at Global Meet on Applied science, Engineering, and Technology.

ABSTRACTS BOOK

Personalized and Precision Medicine (PPM) as a Unique Healthcare Model to Be Set Up *via* Biodesign, Bio- and Chemical Engineering, Translational Applications, and Upgraded Business Modeling to Secure the Human Healthcare, Wellness and Biosafety

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Abstract

Traditionally a disease has been defined by its clinical presentation and observable characteristics, not by the underlying molecular mechanisms, pathways and systems biology-related processes specific to a particular patient (ignoring persons-at-risk). A new systems approach to subclinical and/or diseased states and wellness resulted in a new trend in the healthcare services, namely, personalized and precision medicine (PPM).

To achieve the implementation of PPM concept, it is necessary to create a fundamentally new strategy based upon the biomarkers and targets to have a unique impact for the implementation of PPM model into the daily clinical practice and pharma. In this sense, despite breakthroughs in research that have led to an increased understanding of PPM-based human disease, the translation of discoveries into therapies for patients has not kept pace with medical need. It would be extremely useful to integrate data harvesting from different databanks for applications such as prediction and personalization of further treatment to thus provide more tailored measures for the patients and persons-at-risk resulting in improved outcomes and more cost effective use of the latest health care resources including diagnostic (companion ones), preventive and therapeutic (targeted molecular and cellular) etc.

Translational researchers, bio-designers and manufacturers are beginning to realize the promise of PPM, translating to direct benefit to patients or persons-at-risk. For instance, companion diagnostics tools and targeted therapies and biomarkers represent important stakes for the pharma, in terms of market access, of return on investment and of image among the prescribers. At the same time, they probably represent only the

generation of products resulting translational research and applications. So, developing medicines and predictive diagnostic tools requires changes to traditional clinical trial designs, as well as the use of innovative (adaptive) testing procedures that result in new types of data. Making the best use of those innovations and being ready to demonstrate results for regulatory bodies requires specialized knowledge that many clinical development teams don't have. The areas where companies are most likely to encounter challenges, are data analysis and workforce expertise, biomarker and diagnostic test development, and cultural awareness. Navigating those complexities and ever-evolving technologies will pass regulatory muster and provide sufficient data for a successful launch of PPM, is a huge task. So, partnering and forming strategic alliances between researchers, bio-designers, clinicians, business, regulatory bodies and government can help ensure an optimal development program that leverages the Academia and industry experience and FDA's new and evolving toolkit to speed our way to getting new tools into the innovative markets.

Healthcare is undergoing a transformation, and it is imperative to leverage new technologies to support the advent of PPM. This is the reason for developing global scientific, clinical, social, and educational projects in the area of PPM and TraMed to elicit the content of the new trend. The latter would provide a unique platform for dialogue and collaboration among thought leaders and stakeholders in government, academia, industry, foundations, and disease and patient advocacy with an interest in improving the system of healthcare delivery on one hand and drug discovery, development, and translation, on the other one, whilst educating the policy community about issues where biomedical science and policy intersect

What will audience learn from your presentation?

(Try to list 3-5 specific items)

- Explain how the audience will be able to use what they learn?
- How will this help the audience in their job?
- Is this research that other faculty could use to expand their research or teaching?
- Does this provide a practical solution to a problem that could simplify or make a designer's job more efficient?
- Will it improve the accuracy of a design, or provide new information to assist in a design problem?
- List all other benefits.

Biography

Sergey Suchkov was born in the City of Astrakhan, Russia, in a family of dynasty medical doctors. In 1980, graduated from Astrakhan State Medical University and was awarded with MD. In 1985, Suchkov maintained his PhD as a PhD student of the I.M. Sechenov Moscow Medical Academy and Institute of Medical Enzymology. In 2001, Suchkov maintained his Doctor Degree at the National Institute of Immunology, Russia.

Fractal Aspects and Critical Lengthscales in Ferroelectrics

Kenji Uchino

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Abstract

Particle size dependence of ferroelectricity was first demonstrated by Uchino on barium titanate and lead titanate based ceramics. Thin film ferroelectrics are known to degrade their performance with reducing the film thickness. Based on these experimental results, Uchino will discuss size effect on ferroelectricity in particle, thin film and amorphous statuses. Ferroelectric materials behave as fractal systems in their various dynamic characteristics. Polarization reversal takes place through the appearance of a certain number of seeds for domains of the opposite polarization which subsequently grow in the forward and lateral directions. The system manifests fractal properties, since lateral growth of the domain walls in the result of the formation of self-similar structures. The interest in relaxor ferroelectrics is stimulated by a diffuse phase transition in a wide temperature range, and dielectric relaxation, which seems to be originated from micro-domains created in unpoled crystals. In this paper, the author will refresh the previously-reported experimental results on (1) Dependence of the Crystal Structure on Particle Size [K. Uchino, E. Sadanaga and T. Hirose: J. Amer. Ceram. Soc. 72 (8), 1555-1558 (1989)], (2) critical exponents in the dielectric permittivity [K. Uchino and S. Nomura: Ferroelectrics Letters, 44, 55 (1982)] and (3) acoustic emission (AE) during the domain reversal [H. Aburatani, J. Witham and K. Uchino: J. J Appl. Phys., 37, 602 (1998)] from a consistent viewpoint, i.e., fractal analysis, aiming at recruiting new researchers in this field.

Biography

Kenji Uchino, the pioneer in “piezoelectric actuators”, was Director of International Center for Actuators and Transducers, and is currently Professor Emeritus of EE at The Pennsylvania State University. He was President of Micromechatronics, PA and also Navy Ambassador to Japan from US Office of Naval Research. Uchino

received Ph. D. degree from Tokyo Institute of Technology, Japan, then became Research Associate at this university (1976). He joined Sophia University, Japan as Associate Professor (1985), then was recruited from The Penn State in 1991. Uchino is a Life Fellow of American Ceramic Society and IEEE, and also a recipient of 31 awards, including Distinguished Lecturer of the IEEE UFFC Society, International Ceramic Award from Global Academy of Ceramics, IEEE-UFFC Ferroelectrics Recognition Award. He has authored 582 papers, 87 books and 33 patents in the ceramic actuator area, leading to his h-index 79.

Use of iron nanomaterials for the treatment of emergent contaminants in water

Marta Irene Litter

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Abstract

Iron-based nanomaterials are increasingly used in environmental applications. Different types of iron-based nanomaterials, namely, zerovalent iron nanoparticles, nanoparticles of iron oxides, and nanoparticles prepared from iron salts and natural extracts by green procedures, are briefly indicated in this presentation, together with their preparation, characterization, and applications in the treatment of pollutants in water, with emphasis on the works performed in the last 10 years. In terms of preparation, top-down procedures such as mechanical milling, nanolithography, laser ablation, sputtering, and thermal decomposition, and bottom-up methods such as chemical synthesis, sol-gel, spinning, chemical vapor deposition (CVD), pyrolysis, and biosynthesis are indicated for nanoparticle production. The most commonly used nanomaterials are inorganic nanoparticles based on metal and metal oxides and, among them, iron-based materials have been widely used in the removal of pollutants in water. Among pollutants, halogenated organics, nitroaromatics, pesticides, dyes, antibiotics, halogenated aromatics, phenolic compounds, PCBs, inorganic anions such as nitrate and heavy metals and metalloids (e.g., Hg, Pb, Cr, Cu, As, Ni, Zn, Cd, and Ag); radioisotopes of Ba, TcO_4, and U, and antibacterial activity against Gram-positive and negative bacteria have been successfully treated. In some cases, iron-based nanoparticles have been combined with H_2O_2 in Fenton processes. In this presentation, examples of emergent contaminants are specially discussed. The advantages of using these materials and the need for their improvement to extend their deployment are remarked.

Keywords: Iron-based nanomaterials, Removal of pollutants, Emergent pollutants, Water.

Biography

Prof. Litter is Dr. in Chemistry (Buenos Aires University, Argentina), with postdoctoral studies at the University of Arizona, USA. She is a Senior Researcher at the National Research Council and a Full Professor and Consultant at the National University of San Martín (Argentina). She has more than 250 publications in journals, books, and book chapters. She received the Mercosur Prize (2006 and 2011), the Charreau Prize for Regional Scientific-Technological Cooperation, the Prize for Latin American Women in Chemistry (2021), and the Houssay Prize (2022).

Advanced Functionalized Asphalt. Texture and Optical Non-Invasive Microtopographic Characterization

Manuel F. M. Costa

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Abstract

The incorporation of electrochromic elements onto asphalt mixture or the application of advanced coating can improve the performance of asphalt and allow a reduced environmental impact of vehicle circulation. A brief overview will be given. The inspection and characterization of the texture of rough surfaces, like most of the ones that can be found in pavements, it's a difficult and complex process. The success of the process is highly dependent not only on the metrological tolerances but also on the particular characteristics of the surface, both physical and compositional but also on what concerns its tridimensionality. In this communication we will also give a brief overview of most common surface texture inspection methods focusing of optical and non-contact/non-invasive ones. 2D and 3D Texture characterization parameters and functions will be briefly presented as well as fractal characterization and Fourier analysis giving some examples of the inspection of asphalt using the MICROTOP.06.MFC microtopographer at the Microtopography Laboratory of the Physics Department of the University of Minho.

Biography

Manuel F. M. Costa hold a PhD degree in Science (Physics) from the University of Minho (Portugal) working since 1985 at its Physics Department teaching and performing applied research in optical metrology, image processing, thin films nanostructures and applications, instrumentation, and science education. Presented and published around four hundred scientific works.

Process development of enzymatic biodiesel production from sludge palm oil using a low-cost liquid lipase from *Aspergillus oryzae*

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Abstract

Currently, low-quality and non-edible feedstocks are favourable for biodiesel production to avoid the 'food-versus-fuel' conundrum. Sludge palm oil (SPO) is an attractive feedstock because it is non-edible, inexpensive and abundantly available. Since SPO contains high content of water and free fatty acid (FFA), the conventional biodiesel production method is unsuitable. This research aims to develop an efficient, economical, and sustainable process to produce biodiesel from SPO via the enzymatic route. The enzyme used was a low-cost and commercial liquid lipase produced from genetically modified *Aspergillus oryzae*. The obtainable biodiesel and FFA content were 94 and 3.7 wt%, respectively under low-input process conditions. This study also evaluated the feasibility of lab-scale one-pot crude enzymatic biodiesel purification process. The biodiesel produced from SPO using the low-cost liquid lipase was tested on diesel engine to evaluate its engine performances and gas emission. All tested fules have a low calorific value compared to commercial diesel fuel. The output power from the enzymatic-produced SPO-biodiesel and its blends were comparable with that of the commercial petro-diesel B10. CO emissions for the purified enzymatic SPO-biodiesel is found to be the lowest, whereas the crude enzymatic SPO-biodiesel emits the highest NOx. One-pot crude enzymatic biodiesel purification process is simple and effective; thus, it can potentially be implemented in biodiesel industry.

Biography

Dr. Cher Pin Song has completed his PhD from Monash University Malaysia in 2017. He has published over 20 papers in reputed journals and has secured multiple research grants from government and industry as both principal investigator and co-principal investigator amounting to more than USD 1,300,000. His research interest has mostly been revolving around the development of a sustainable and environmentally-friendly bioprocesses for biofuel production and bioproducts extraction. His research studies involve the use of low-toxic ionic liquids and low-cost biocatalysts in the design of enzymatic processes which are ecofriendly and economical feasible.

Desulphurised waste

Jamal Khatib

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Abstract

The use of coal in power station causes various environmental problems due to the emission of Carbon Dioxide (CO2), Sulphur (SOx) and Nitrogen (NOx) oxide into the atmosphere. In addition, there is a huge amounts of fly ash produced due to the combustion of fossil fuel (i.e. coal). In an attempt to reduce the amounts of sulphur emitted, companies in many parts of the world opted to inject an alkali sorbent which would react to produce desulphurised products. There are mainly three differrent processes for desuphurisation; wet, dry and semi-dry process. The desulphurised residues can range from pure gypsum to a comination of fly ash and gypsum. This research will examine the different oxide compositions for the various desulphurised waste products. The properties of construction materials containing these various desulphurised products as partial replacement of cement will be presented. These include mechanical properties, physical properties and durability properties. Recommendations for future research will be conducted.

Development of a Simulation-Based Contact Pressure Prediction Model to Balance Biosignal Quality and Wear Comfort

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[2] *Textile and Apparel, Technology and Management, North Carolina State University, Raleigh, NC, 27606.*

Abstract

The engineering of smart clothing for health monitoring applications necessitates precise design to obtain accurate biosignals, including Electrocardiogram (ECG) and Electromyography (EMG). However, ensuring the wear comfort of such garments is essential. Achieving the balance between the necessary contact pressure for optimal biopotential signal quality and wearer comfort presents a significant challenge. Although several studies determined the optimal contact pressure from both functional and wear comfort perspectives, there is a lack of guidance regarding the selection of appropriate materials and sizing to achieve the specifically required contact pressure for diverse body types. This study addresses this gap by leveraging three-dimensional (3D) garment simulation technology to develop a contact pressure prediction model (CP model) grounded in simulation parameters. The developed CP model offers guidance for wearable garment designers in selecting appropriate weft knit fabrics and sizing for smart clothing design for strategic health monitoring. Thus, the CP model aids in achieving good bio signals while simultaneously ensuring wearer comfort.

Keywords: Contact pressure, knit fabrics, biosignals, 3D simulation, Wearables, ECG signal

Distal Functionalization via Transition Metal Catalysis

Haibo Ge

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Abstract

The ubiquitous presence of sp^3 C−H bonds in natural feedstock makes them inexpensive, easily accessible, and attractive synthons for the preparation of common and/or complex molecular frameworks in biologically active natural products, pharmaceutics, agrochemicals, and materials. However, the inertness of these bonds due to the high bond dissociation energies and low polarity difference between the carbon and hydrogen atoms makes them challenging reaction partners. Moreover, the desired site-selectivity is often an issue in reactions with multiple analogous sp^3 C−H bonds. To overcome these problems, transition metal-catalyzed C−H functionalization has been developed with the assistance of various well-designed directing groups which can coordinate to a metal center to deliver it on a targeted C−H bond through an appropriate spatial arrangement, enabling C−H activation via the formation of a cyclometalated species. However, the requirement of often additional steps for the construction of the directing groups and their subsequent removal after the desired operation severely hampers the efficacy and compatibility of the reactions. A promising solution would be the utilization of a transient ligand which can bind to the substrate and coordinate to the metal center in a reversible fashion. In this way, the directing group is installed, sp^3 C−H functionalization occurs, and the directing group is then removed *in situ* without affecting the substrate function after the catalysis is finished. Overall, the whole process occurs in a single reaction pot. Herein, we are presenting our studies on transition metal-catalyzed transient directing group-enabled C−H functionalization reaction.

Biography

Haibo Ge received his PhD degree in Medicinal Chemistry from The University of Kansas in 2006, and then moved to The Scripps Research Institute for postdoctoral study. In 2009, he began his independent academic career at the Indiana University – Purdue University Indianapolis and relocated to Texas Tech University in 2020. Research by his group is mainly focused on the development of novel methods for carbon–carbon and carbon–heteroatom bond formation through transition metal catalyzed C–H functionalization.

Contactless Magnetic Sensing in Condition Monitoring and Anomaly Detection for Smart Grid: New Possibilities and Alternatives

Philip W. T. Pong

New Jersey Institute of Technology, USA.

Abstract

Our physical and cyber environments are becoming increasingly intertwined with smarter sensing, communication, and data analytics. Our daily livings are indeed surrounded by a wide variety of sensors, IoT connectivity, and edge computing devices, constituting smart grid, smart city, smart transportation, and so on. The availability of sensing devices with measurement, communication, and processing capabilities is providing fine-grained data. Together with multimodal sensory data collection and sensor fusion can result in actionable insights and decisions. This synergy can lead to improved ways and quality of life in what we call smart living.

Magnetism is one of the six energy forms of measurands in sensing. Magnetic sensing plays a critical role in smart living due to various sources of magnetic fields such as magnetic fields from current-carrying wires and permanent magnets which are geometrically determined by Biot-Savart Law and Ampere's Law respectively. These magnetic fields can range from DC to AC, from low frequency to high frequency. Modern civilization heavily relies on electricity which are generated, transmitted, and utilized through various kinds of transmission medium and electrical machines that are composed of current-carrying conductors, electromagnets, and permanent magnets. As such, magnetic field sensing is an important source of data and thus information for condition monitoring of power generation, transmission, and distribution.

In this talk, we will discuss the various opportunities and alternatives magnetic field sensing can offer in condition monitoring and anomaly detection in smart grid and smart city. Since it is contactless sensing, its installation is easy and it can be easily retrofitted to the existing plant and equipment. This will minimize cost, avoid wear and tear, and meet stringent reliability requirement. Contactless magnetic sensing can complement the traditional contact measurement techniques and help to overcome the major obstacle towards pervasive sensing due to its scalability.

Biography

Philip W. T. Pong received a B.Eng. from the University of Hong Kong (HKU) in 2002 with 1st class honours. Then he obtained a PhD in engineering at the University of Cambridge in 2005. He was a postdoctoral researcher at the Magnetic Materials Group at the National Institute of Standards and Technology (NIST) for three years. Currently he is an Associate Professor in the Department of Electrical and Computer Engineering at New Jersey Institute of Technology (NJIT). His research interest focuses on the fault detection, predictive maintenance, and anomaly detection of power grid. He is the Founding Director of the Green Technology Research and Training Laboratory, leading the research and education activities of offshore wind energy at NJIT.

The Application of New Technologies in Enterprise Design, operation and management

Seraj Y. Abed

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Abstract

Enterprises regardless of their types of operations face great challenges nowadays. Mainly, in preforming their daily activities, operating efficiently and maintaining their market competitiveness. The business environment is experiencing great changes recently. Political conflicts are increasing seriously; the US chines tension is escalating continuously, the Russian invasion of Ukraine has caused a serious threat to European countries and USA that led to a direct military confrontation between Naito and Russia supported implicitly by China and North Korea. This conflict in Europe has caused an alarming situation in the world political stability and economic conditions. The weakening European Union and the current unfavorable US European relations are also affecting the world political stability and economic order. Economic conditions are also changing negatively; inflation, rising interest rates, recession, energy prices, human resources cost, raw material cost, supply chain rising cost are making things more difficult for enterprises to remain competitive, achieve their business goals and maintain their sustainability. In order for enterprises to face current challenges they have to redesign their architecture, processes, information infrastructure and adoption of technology. Enterprises have to be very effective and highly efficient. They should be able to produce their products and render their service within the right time, quality and cost at the right place. Enterprises have to be very flexible and highly agile to be able to adopt to the current and future fast changing political, economical, social, environmental conditions and technological advancements. Adoption of new technologies such as Industry 4.0, Blockchain, Internet of things and Artificial Intelligence are excellent enablers for enterprises to face current and future challenges, in a very fast unstable changing world.

Biography

Seraj Y. Abed has completed his PhD in Industrial Engineering – System Modeling and Simulation from Iowa State University, USA. Since 1982, he has been a faculty member, at the Industrial Engineering Department, Faculty of Engineering, King Abdul Aziz University, Jeddah, Saudi Arabia. He taught 23 courses in undergraduate and graduate levels, supervised more than 50 senior projects, 50 master thesis and published 48 papers in reputed journals and conferences. He also served as a consultant in several government organizations and private companies. His areas of expertise are: System Simulation, System Engineering, Enterprise Engineering and Management, and Information System.

Improving the Fatigue Design of Mechanical Systems such as Refrigerator

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Abstract

To enhance the lifetime of mechanical system such as automobile, new reliability methodology – parametric Accelerated Life Testing (ALT) – suggests to produce the reliability quantitative (RQ) specifications—mission cycle—for identifying the design defects and modifying them. It incorporates: (1) a parametric ALT plan formed on system BX lifetime that will be X percent of the cumulated failure, (2) a load examination for ALT, (3) a customized parametric ALTs with the design alternatives, and (4) an assessment if the system design(s) fulfil the objective BX lifetime. So we suggest a BX life concept, life-stress (LS) model with a new effort idea, accelerated factor, and sample size equation. This new parametric ALT should help an engineer to discover the missing design parameters of the mechanical system influencing reliability in the design process. As the improper designs are experimentally identified, the mechanical system can recognize the reliability as computed by the growth in lifetime, LB, and the decrease in failure rate. Consequently, companies can escape recalls due to the product failures from the marketplace. As an experiment instance, two cases were investigated: 1) problematic reciprocating compressors in the French-door refrigerators returned from the marketplace and 2) the redesign of hinge kit system (HKS) in a domestic refrigerator. After a customized parametric ALT, the mechanical systems such as compressor and HKS with design alternatives were anticipated to fulfil the lifetime – B1 life 10 year.

Biography

Dr Woo has a BS and MS in Mechanical Engineering, and he has obtained PhD in Mechanical Engineering from Texas A&M. He majors in energy system such as HVAC and its heat transfer, optimal design and control of refrigerator, reliability design of thermal components, and failure Analysis of thermal components in marketplace using the Non-destructive such as SEM & XRAY. In 1992.03–1997 he worked in Agency for Defense Development, Chinhae, South Korea, where he has researcher in charge of Development of Naval weapon System. He was working as a Senior Reliability Engineer in Refrigerator Division, Digital Appliance, SAMSUNG Electronics. Now he is working as associate professor in mechanical department, Ethiopian Technical University.

Advanced architectures of Next Generation Wireless Networks

Pascal Lorenz

University of Haute-Alsace, France, France.

Abstract

Internet Quality of Service (QoS) mechanisms are expected to enable wide spread use of real time services. New standards and new communication architectures allowing guaranteed QoS services are now developed. We will cover the issues of QoS provisioning in heterogeneous networks, Internet access over 5G networks and discusses most emerging technologies in the area of networks and telecommunications such as IoT, SDN, Edge Computing and MEC networking. We will also present routing, security, baseline architectures of the inter-networking protocols and end-to-end traffic management issues.

Biography

Pascal Lorenz (lorenz@ieee.org) received his M.Sc. (1990) and Ph.D. (1994) from the University of Nancy, France. Between 1990 and 1995 he was a research engineer at WorldFIP Europe and at Alcatel-Alsthom. He is a professor at the University of Haute-Alsace, France, since 1995. His research interests include QoS, wireless networks and high-speed networks. He is the author/co-author of 3 books, 3 patents and 200 international publications in refereed journals and conferences. He was Technical Editor of the IEEE Communications Magazine Editorial Board (2000-2006), IEEE Networks Magazine since 2015, IEEE Transactions on Vehicular Technology since 2017, Chair of IEEE ComSoc France (2014-2020), Financial chair of IEEE France (2017-2022), Chair of Vertical Issues in Communication Systems Technical Committee Cluster (2008-2009), Chair of the Communications Systems Integration and Modeling Technical Committee (2003-2009), Chair of the Communications Software Technical Committee (2008-2010) and Chair of the Technical Committee on Information Infrastructure and Networking (2016-2017), Chair of IEEE/ComSoc Satellite and Space Communications Technical (2022-2023), IEEE R8 Finance Committee (2022-2023), IEEE R8 Conference Coordination Committee (2023). He has served as Co-Program Chair of IEEE WCNC'2012 and ICC'2004, Executive Vice-Chair of ICC'2017, TPC Vice Chair of Globecom'2018, Panel sessions co-chair for Globecom'16, tutorial chair of VTC'2013 Spring and WCNC'2010, track chair of PIMRC'2012 and WCNC'2014, symposium Co-Chair at Globecom 2007-2011, Globecom'2019, ICC 2008-2010, ICC'2014 and '2016.

Thermomechanical Transformations for Thermoelasticity and Superelasticity in Shape Memory Alloys

Osman Adiguzel

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Abstract

Shape memory alloys take place in a class of advanced smart materials by giving stimulus response to changes in the external conditions. These alloys are adaptive structural materials and exhibit a peculiar property called shape memory effect, with the recoverability of two shapes at different conditions. This phenomenon is initiated with thermomechanical treatments on cooling and deformation and performed thermally on heating and cooling, with which shape of the material cycles between original and deformed shapes in reversible way. Therefore, this behavior can be called thermal memory or thermoelasticity. Deformation in low temperature condition is plastic deformation, with which strain energy is stored in the materials and released on heating by recovering the original shape. This phenomenon is governed by the thermomechanical and thermoresponsive transformations, thermal and stress induced martensitic transformations. Thermal induced martensitic transformations occur on cooling with cooperative movement of atoms in <110 > -type directions on a {110} -type plane of austenite matrix, along with lattice twinning reaction, and ordered parent phase structures turn into the twinned martensite structures. The twinned structures turn into detwinned martensite structures by means of stress induced martensitic transformations with deformation.

These alloys exhibit another property, called superelasticity, which is performed by mechanically stressing and releasing at a constant temperature at the parent phase region, and material recovers the original shape upon releasing, by exhibiting elastic material behavior. Superelasticity is performed in non-linear way, unlike normal elastic materials behavior, loading and releasing paths are different, and cycling loop refers to the energy dissipation. Superelasticity is also result of stress induced martensitic transformation, and the ordered parent phase structures turn into the detwinned martensite structures by stressing.

Copper based alloys exhibit this property in metastable beta-phase region. Lattice twinning is not uniform in these alloys and cause the formation of complex layered structures. The layered structures can be described by different unit cells as 3R, 9R or 18R depending on the stacking sequences on the close-packed planes of the ordered lattice. The unit cell and periodicity are completed through 18 layers in direction z, in case of 18R martensite, and unit cells are not periodic in short range in direction z.

In the present contribution, x-ray diffraction and transmission electron microscopy (TEM) studies were carried out on copper based CuAlMn and CuZnAl alloys. X-ray diffraction profiles and electron diffraction patterns exhibit super lattice reflections. X-ray diffractograms taken in a long-time interval show that diffraction angles and intensities of diffraction peaks change with the aging duration at room temperature. This result refers to the rearrangement of atoms in diffusive manner.

Keywords: Shape memory effect, martensitic transformation, thermoelasticity, superelasticity, lattice twinning, detwinning.

Biography

Dr. Adiguzel graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD- degree from Dicle University, Diyarbakir-Turkey. He has studied at Surrey University, Guildford, UK, as a post-doctoral research scientist in 1986-1987, and studied on shape memory alloys. He worked as research assistant, 1975-80, at Dicle University and shifted to Firat University, Elazig, Turkey in 1980. He became professor in 1996, and he has been retired on November 28, 2019, due to the age limit of 67, following academic life of 45 years. He published over 80 papers in international and national journals; He joined over 120 conferences and symposia in international and national level as participant, invited speaker or keynote speaker with contributions of oral or poster. He served the program chair or conference chair/co-chair in some of these activities. In particular, he joined in last six years (2014 - 2019) over 60 conferences as Keynote Speaker and Conference Co-Chair organized by different companies. Also, he joined over 120 online conferences in the same way in pandemic period of 2020-2022. He supervised 5 PhD- theses and 3 M. Sc- theses. Dr. Adiguzel served his directorate of Graduate School of Natural and Applied Sciences, Firat University, in 1999-2004. He received a certificate awarded to him and his experimental group in recognition of significant contribution of 2 patterns to the Powder Diffraction File – Release 2000. The ICDD (International Centre for Diffraction Data) also appreciates cooperation of his group and interest in Powder Diffraction File.

Designing Advanced Nanomaterials for Selected Organic Transformations and Water Splitting Applications

Tokeer Ahmad

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Abstract

Multifunctional nanostructures find the possibility for their applications in water splitting processes for hydrogen generation as a renewable source of green energy. The studies of some multifunctional nanoparticles by chemical synthesis reveal the formation of monophasic nanostructures with fairly uniform distribution of nearly spherical particles, high specific surface area and visible optical band gap. Photocatalytic generation of hydrogen in water splitting process by using as-prepared nanoparticles has also been studied under the visible light irradiations which showed a significant H2 evolution reaction rate. The development of nanostructured catalysts has also been preferred to carry out the heterogeneous catalytic organic transformations because of greater number of surface-active sites for catalytic processes, high catalyst recovery rate, especially their

environment friendly nature and their ease of synthesis. Besides the advances in nanocatalysis, certain challenges including not well-defined morphologies due to loss of control over it and loss of catalytic activity during operation need to be addressed. Herein, we discuss some nanocatalysts for certain organic transformation reactions with enhanced activity as well as in water splitting reactions for hydrogen production.

Keywords: Heterostructures; Photocatalysis; Electrocatalysis; Hydrogen Production.

Biography

Prof. Tokeer Ahmad is graduated from IIT Roorkee and Ph.D. from IIT Delhi. Presently, he is full Professor at Department of Chemistry, Jamia Millia Islamia, New Delhi since 2019. Prof. Ahmad has supervised 15 PhD's, 77 postgraduates, 9 projects, published 177 research papers, one patent and three books with research citation of 6270, h-index of 47 and i10-index of 128. Prof. Ahmad is active reviewer of 151 journals, delivered 150 Invited talks, evaluated 53 external doctoral theses and presented 128 conference papers. Prof. Ahmad is the recipient of MRSI Medal, SMC Bronze Medal, ISCAS Medal, Inspired Teacher's President Award, DST-DFG award, Distinguished Scientist Award, Maulana Abul Kalam Azad Excellence Award of Education, Teacher's Excellence Award and elected as Member of National Academy of Sciences India. Prof. Ahmad has been figured in World Top 2% Scientists for consecutive four years since 2020 in both coveted lists including career long by Stanford University, USA. Prof. Ahmad has been recently admitted as Fellow of Royal Society of Chemistry (FRSC), UK.

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