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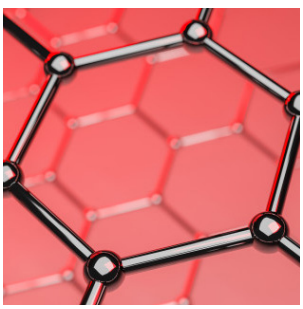
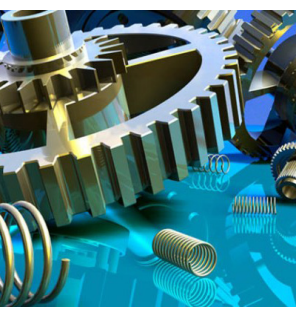
Workshop

Material Science 2019





3rd International Conference on

Materials Science and Engineering

October 07-08, 2019 | Frankfurt, Germany

Reza Javaherdashti

Paracorrosion Consultants, Australia

A Masterclass training workshop on microbiological corrosion of engineering materials: Causes, remedies, facts & semi-facts

Microbiologically influenced corrosion (MIC) is an electrrochemical corrosion that can be initiated, enhanced or even decelarted by the action of certain micro-organisms, mainly bacteria and their "cousins" Archaea. Perhaps the most widely known of corrosion-related bacteria (CRB) to industry is SRB (sulphate reducing bacteria) and there are still professionals who think SRB are the most important CRB particularly in pipeline industry. New findings suggest otherwise : in fact there are some fifteen types of both CRB and CRA (corrosion related Archaea) that can induce corrosion to almost all engineering materaisl, metals and non-metals alike.

In addition to being rrather unknown for some industries, there are several myths surrounding recognitioon and treatment of MIC too, myths like stainless steels are immune to MIC or cathodic protection can cure MIC forr good .

In this two-hour training masterclass, Dr. Reza Javaherdashti will discuss the state-of-the-art of MIC and what is available to identifyandcureitalongwithsomeprosandconsofeachmethod.

This mastercalss could be very useful for:

- Technical Inspection Professionals
- Corrosion Management Professionals
- Operation and repair Professionals
- Integrity Management Professionals
- Water treatment professionals
- Structural and process Professionals
- HSE /safety Professionals
- Coating and paint /Cathodic protection/Chemical treatment /Materials Selection Professionals
- Testing and laboratory Professionals

Speaker Biography

Reza Javaherdashti holds a double degree in Materials Science and Metallurgical Engineering. In addition to being an internationally renowned expert on microbial corrosion, He has several internationally referenced books and papers on the subject. He has over 20 years of field and academic experience as both a consultant and a researcher. He is the first scientist who has applied Fuzzy logic in prediction the risk of microbial corrosion successfully. While as an engineer corrosion is his passion., as a manager he has grown interest in studies related to the cost of corrosion. He was the first who applied Future Studies to present a Futuristic model for managers that had corrosion as its integral element.

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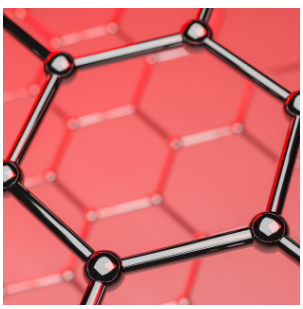
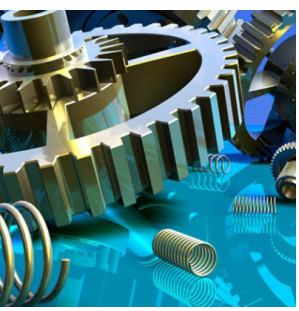
Scientific Tracks & Sessions
October 07, 2019

Material Science 2019





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Bosch DRIE enabler for MEMS - Invention and technical progress

Andrea Urban
Robert Bosch GmbH, Germany

MEMS (Micro Electro Mechanical Systems) at Bosch look back on 30 years of development and production. Silicon Deep Reactive Ion Etching (DRIE), also known as the "Bosch Process", is one of the worldwide established MEMS key manufacturing processes on the market. The starting point of this plasma trench etch process for silicon dates back to the development in the early 1990's at Bosch Corporate Research Center on a prototype equipment. "Bosch DRIE" became the enabler for silicon MEMS applications and products. A large variety of interesting bulk and surface micro machined MEMS products on the market address automotive, consumer and IoT applications, which nowadays support the daily life of all of us. These are pressure sensors, micro mirrors, microphone devices, gas flow and fluidic sensors, through-silicon-vias (TSV's) and inertial sensors. New automotive and consumer applications like autonomous driving or virtual reality are increasingly pushing inertial sensor performance improvements like higher sensitivity and resolution. This demands a technical progress on "Bosch DRIE", with progress mainly focused on the plasma etch equipment side. Cross wafer results and sensor performance is strongly influenced by plasma reactor conditions like chamber geometry, gas distribution, plasma source and substrate electrode construction and with strong influences of plasma reactor materials on sensor response and wafer test results. Therefore, a close co-operation between equipment suppliers and MEMS manufacturers is needed to improve and optimize DRIE equipment hardware and processes, in parallel to product development, in order to fulfil enhanced MEMS product requirements for the future.

The "Bosch Process" turned out to be the key technology behind the worldwide production of billions of silicon MEMS sensors every year, able to structure silicon at arbitrary shapes with very high etch rates and at extremely high precision nowadays.

Speaker Biography

Andrea Urban, born at Schilp in 1967, Waiblingen, Germany. She graduated her high school in 1987. She completed her diploma in 1992 in the Studies of "Materials Engineering and Surface Technologies", at Fachhochschule Aalen, Germany. She joined the Robert Bosch GmbH Corporate Research and Technology Center in Stuttgart, Germany in 1992. She is working as a technology specialist mainly related to inertial sensor manufacturing, which strongly influenced the development and installation of MEMS acceleration sensors and gyroscopes for mass-manufacturing in Bosch`s production line. She is the co-inventor of the "Bosch Deep Reactive Ion Etching Process". She was entrusted with the co-ordination of the European Semiconductor Equipment Assessment I-SPEEDER project, which had a significant impact on the equipment tool basis for advanced Deep Reactive Ion Etching. In 2003, she joined as the new founded Engineering Sensor Process Technology division at Robert Bosch GmbH, Reutlingen, Germany. As a Senior Expert working on the development of new process technologies and their transfer into series production for upcoming generations of MEMS sensors.

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Photo definable low D_k, D_f polyimide

Masao Tomikawa, Hitoshi Araki, Masaya Jukei, Hisashi Ogasawara and **Akira Shimada**
Toray Industries Inc, Japan

For an establishment of high-speed, large-capacity, many-accessible with short delay communication network, 5G technical format is eager to use higher frequency to have wide frequency band width. In addition, millimeter radar which is indispensable tool for the collision avoidance of the car, will use 60 to 70GHz band. In this work, we studied the effect of polyimide structure on D_f and to develop low D_f polyimides. To understand the effect of polyimide molecular on D_f dynamic mechanical measurement (DMA) technique was used by different frequency measurements during -150 to 100 degree Celsius. As frequency temperature converting law, we can estimate the wide range frequency molecular relaxation data by those DMA data. From the frequency dependency, low temperature molecular relaxation might affect the high frequency D_f value. From those observation, we designed novel polyimide 2.9 of D_k and 0.001 of D_f at 20GHz by decreasing molecular motion at low temperature region. Then photosensitive polyimide having D_k 3.0 and D_f 0.004 at 20GHz was obtained.

Speaker Biography

Masao Tomikawa now is research fellow of Toray Industries Inc., Member of The Chemical Society Japan, The Society of Polymer Science Japan, The Society of Fiber Science and Technology Japan, American Chemical Society, IEEE. He obtained his BS and MS. in agriculture at The University Tokyo, Engineering Doctor's degree (Ph.D.) at Tokyo Institute Technology and awarded from The Chemical Society Japan (2007) and The Society of Polymer Science Japan (1991), and Japan Institute of Invention and Innovation for unique Patent. He has many papers and patens. He is a specialist of photo sensitive polyimide chemistry.

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Implementation and introduction of machine learning concept in material invention and discovery to attract the interest of the scholars towards material science

Varun Singh[1], Isha[2] and **Shailender Gaur[3]**
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[3]PWD B&R Br Hisar India

Thousands of years, lakhs of man hours & we discovered them, the materials, our nature earth has manufactured for us. Our needs are not satisfied with what mother earth has provided us and our hungry mind clamours for more resources, more energy, more power and more materials-futuristic materials. Every bit of time researchers are digging their mind to invent a new form for material for new generation machines and equipments.

I must repeat thousands of man hours are and will be invested in these researches. We have figured it out that we need a helping hand other than just our human brains; yes! I am talking about machine learning – The artificial intelligence. Why the students pursuing their degrees show least interest in the subject of material science in general as compared to other subjects? Say as Automotive, Aerospace, Design or IT etc. If we go through the pattern of research in the field of material science, students pursuing their bachelors or masters find it a boring history of black and white words and they have to struggle to keep their interest in this "glorious" field. To make it more interesting, practical & result oriented discipline of study we can introduce the machine learning based tools in the learning of material science. Doing so, students will be able to connect more to the subject & will enjoy this practical & result oriented learning concept & will not hesitate experimenting with the materials. The interest will arise in the newly born scholars leading to more researches; the outcome will benefit the needy tools & machines in want of futuristic materials ahead of time.

Speaker Biography

Varun Singh has completed his Bachelor of Engineering in Mechanical Engineering from Maharshi Dayanad University, Rohtak-Haryana (India). He is working as a Sub Divisional Engineer, Mechanical Sub Division, PWD B&R Br., Rohtak, Haryana- India.

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Optical absorption and photoluminesnescence properties of Sm^{3+} doped B_2O_3-ZnO-Li_2O-Na_2O-PbO glasses system

Juniastel Rajagukguk, Chayani Sarumaha, Rappel Situmorang and **Jakrapong Kaewkhao**
Universitas Negeri Medan, Indonesia

Borate glasses are one of the appropriate materials combained with rare earth ion for fabricating photonic devices. This article reports on spectroscopic and photoluminescence properties of (65-x) B_2O_3:15 Na_2O:10PbO: 5Z_nO:5Li_2O: x Sm_2O_3 glasses (where x = 0.05; 0.1; 0.5; 1.0; 2.0 and 4.0 mol%). The glasses have been prepared using the melt-quenching method with total mass of 20 grams mixed in alumina crucible. The optimum size of 3 mm x 10 mmx 10 mm glasses were obtained by cutting and polishing for absorption, infrared, photoluminescence and excitation spectra investigations. Density, XRD and also energy band gap properties were observed to explain the physical phenomena of the glass samples. The results show that the glass structure of Sm^{3+} doped borate glass system confirms to the amorphous phase. The addition of Sm_2O_3 ion in matrix glass from 0.05 mol% to 4.0 mol% causes the absorption intensiy increases. The different pattern occur on photoluminescence spectra, where the highest emission intensity achieved on 0.1 mol% Sm_2O_3 for $^6H_{5/2} \rightarrow {}^4K_{11/2}$ transition. Whereas the lowest emission intensity experienced by 4.0 mol% Sm_2O_3. From photoluminescence spectrum, it is well be known that there are ten transition bands corresponding to 6H5/2 $\rightarrow {}^4F_{11/2}$; $^6H_{5/2} \rightarrow {}^3H_{7/2}$; $^6H_{5/2} \rightarrow {}^4F_{9/2}$; $^6H_{5/2} \rightarrow {}^4D_{5/2}$; $^6H_{5/2} \rightarrow {}^4K_{11/2}$; $^6H_{5/2} \rightarrow {}^6P_{5/2}$; $^M{}_{19/2}$; $^6H_{5/2} \rightarrow {}^4G_{9/2}$; $^4I_{15/2}$; $^6H_{5/2} \rightarrow {}^4F_{5/2}$; $^4I_{13/2}$; $^6H_{5/2} \rightarrow {}^4I_{11/2}$; $^4M_{15/2}$.

Speaker Biography

Juniastel Rajagukguk has completed PhD from Institut Technology Bantung (ITB) on 2016. He is a Associate Profesor at Physics Department, Faculty of Mathematics and Natural Sciences, Universitas Negeri Medan (Unimed) – Medan City, Indonesia from 2008 –now. He has over 30 publications that have been cited over 60 times with H-index from scopus databased is 3. Now he is active in the research field of Optical Spectroscopic of glasses material doped with some rare earth ions such as Nd^{3+}, Er^{3+}, Eu^{3+}, Sm^{3+} and Dy^{3+} and also a reviewer of International Journal.

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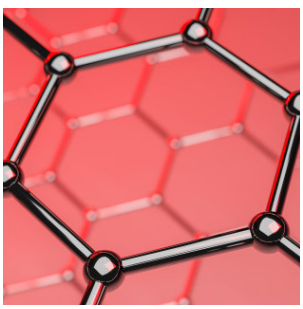
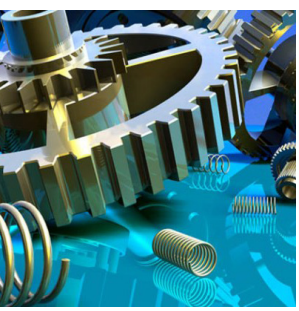
Special Session

Material Science 2019





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2-Hydroxyethyl Methacrylate (HEMA) treatment modulates the autophagic process in stem cell from human dental pulp trough ERK/pERK signalling

Guya Diletta Marconi and **Jacopo Pizzicannella**
University D'Annunzio Chieti-Pescara, Italy

Autophagy is an intracellular process that degrades organelles or cellular components in order to ensure the maintenance of cell homeostasis. It can be considered a genetically programmed, adaptive response to stress. In restorative dentistry practice, free resin monomers of can be released. The aim of this study was to investigate the effect of HEMA on proliferation and autophagy in human dental pulp stem cells (hDPSCs). Human DPSCs were treated with different concentrations of HEMA (3 and 5 mmol L-1). To evaluate the proliferation rate, MTT and trypan blue assays were used. Autophagic markers such as microtubule-associated protein 1 light chain 3 (LC3-I/II) and ubiquitin-binding protein (p62) were analyzed through immunofluorescence observations. Beclin1, LC3-I/II, and p62 were evaluated by means of Western blotting detection. Considering that activity of extracellular signal-regulated kinase (ERK) and its phosphorylated form (pERK) mediates several cellular processes, such as apoptosis, autophagy, and senescence, the involvement of ERK/pERK signaling was also evaluated. Our results showed a decreased cell proliferation associated with morphological changes in HEMA-treated cells. The Western blot results showed that the expression levels of Beclin1, LC3-I/II, and ERK were significantly elevated in HEMA-treated cells and in cells co-treated with rapamycin, an autophagic promoter. The expression levels of p62 were significantly reduced compared to the untreated samples. Protein levels to the autophagic process, observed at confocal microscopy confirmed the data obtained from the Western blot. The up-regulation of ERK and pERK levels, associated with nuclear translocation, revealed that ERK pathway signaling could act as a promoter of autophagy in dental pulp stem cells treated with HEMA. Then in response to HEMA injury, dental pulp stem cells activate autophagy as a pro-survival cytoprotective mechanism. Further studies are necessary to consider the strategic and therapeutic applications of this research in tissue repair and regeneratio.

Speaker Biography

Guya Diletta Marconi is as Researcher in Biomedical field at Department of Medical, Oral and Biotechnological Sciences, University of Chieti, Italy. She spent one year as a postdoctoral researcher at Torrey Pines Institute for Molecular Studies, in San Diego. She received her Ph.D. in April 2016 in Drug Sciences at University of Chieti, she spent half or her PhD abroad as visiting PhD student at the Sanford Burnham Prebys Medical Discovery Institute in San Diego, where she extended her skills and experience with a focus on the identification and validation of peptides inhibitors of target proteins involved in cancer progression. She works with multidisciplinary group that carry highly translational basic science research. The laboratory of Prof. O. Trubiani, where she works as a researcher, used mesenchymal oral stem cells, aimed to validate novel bioactive scaffolds as promising new approaches for tissue regeneration and repair. The current research is focused on mechanisms involved in stem cell-regulated tissue homeostasis and repair, particularly on the identification of molecules and phenotypic changes responsible for the regulation of the stem cell regenerative potential.

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October 08, 2019

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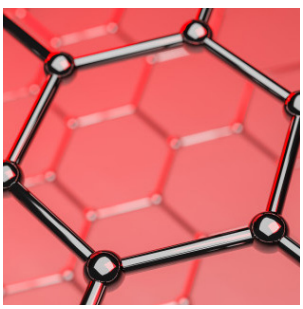

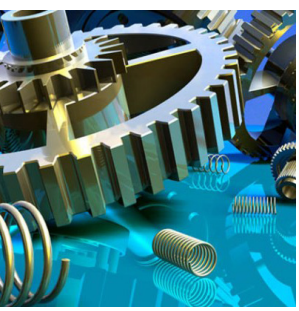

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Mechanical property of nano porous sintered silver: Toward reliability estimation

Keisuke Wakamoto[1], **Yo Mochizuki**[2], **Takukazu Otsuka**[1], **Ken Nakahara**[1] and **Takahiro Namazu**[2]

[1]ROHM Co Ltd, Japan

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Sintered silver as a die attach material has attracted much research attensiton especially in the power electronics field, owing to its high heat dissipation capability. Many electrical systems comprises many die-attach parts electrically connecting semiconductor dies, and the coefficient of thermal expantion (CTE) of these parts differs variously. This inevtibaly leads to repeated mechanical stresses under heat cycle environments, deteriorating the die-attach materials. Thus the mechanical property of sintered silver plays a critical role to estimate the reliability of systems.

In this regard, the porosity inevitably embedded in sinterd silver is an important research issue. Other studies performed tensile tests with thick sintered silver films (over 100µm thick), however the thickness is much larger than that of die-attach layer thickness (~50µm). Thus, we cannot eliminate the possibility of differnt failure mode observation, and/or of underestimating overly the role of porosity. In this study, the authers prepare sintered silver films and bulk silver thin films with thickness of approximately 8-10 µm to focus on how the size of the pores therein affects the mechanical property of the films. The sintered films are fabricated from 5MPa to 60MPa pressure by using silver nanoparticles. The porosity (p) of the films ranges from 5% to 25%. This p is determined by scanning electron microscopy cross-sectional images of the films. For the sintered films, the stress-strain behaviors show no conventional ductile plateau disappears, and the breaking strain, and ultimate tensile strength negatively correlates with p. The tensile fatigue test is performed for the sintered silver with p=5% and the bulk silver. The fatigue lifetime of the silver films is shorter than that of the bulk silver one. The breaking point is larger for the sintered film, but the fatigue lifetime does not reflect this property, determined by the porosity.

Speaker Biography

Keisuke Wakamoto has completed his Master degree at the age of 25 years from Kyoto University, Japan. He is the research engineer of Rohm company Modules R &D group, Japan. His publication was published on May 21 from Japanese Journal of Applied physics 58, SDDL08 (2019).

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Notes:

ALD growth of MoS_2 nanosheets on TiO_2 nanotube supports

Hanna Sopha, Raul Zazpe, Milos Krbal, Filip Dvorak, Ludek Hromadko, Jan Prikryl and **Jan M Macak**
University of Pardubice, Czech Republic

The success of graphene opened a door for a new class of chalcogenide materials with unique properties that can be applied in the semiconductor technology. Monolayers of two-dimensional transition metal dichalcogenides (2D TMDCs) possess a direct band gap that is crucial for optoelectronic applications. Additionally, the direct band gap can be easily tuned by either chemical composition or external stimuli. Next to the optoelectronic applications, where a monolayer planar structure is necessary to employ, a layer of standing flakes, which possesses a large surface area, can be used for hydrogen evolution a photodegradation of organic dyes or as electrodes in Li ion batteries. MoS_2, a typical representative of TMDCs, has been widely studied for many applications. Recently, the possibility to employ ALD as a technique to grow MoS_2 has been reported.

The self-organized TiO_2 nanotube (TNT) layers have attracted considerable scientific and technological interest over the past 15 years motivated for their wide range of applications including (photo-) catalysis, hydrogen generation and biomedical uses. The synthesis of the 1D TNT layers is carried out by a conventional electrochemical anodization of valve Ti metal sheets in various electrolytes. The main drawback of TiO_2 is its applicability in the UV light (wavelengths < 390 nm), thus TNT layers are often coated or decorated with secondary materials. In the recent years, it has become clear that atomic layer deposition (ALD) is the only approach that enables the possibility of coating high aspect ratio structures homogeneously with thin and ultrathin layers of secondary materials. The presentation will focus on the decoration of TNT layers with MoS_2 by ALD, their characterization and applications in various fields. Experimental details and some recent photocatalytic and battery results will be presented and discussed.

Speaker Biography

Hanna Sopha graduated in chemistry at the University of Rostock (Germany) in 2008. After she received Ph.D. degree in analytical chemistry from the University of Ljubljana (Slovenia) in 2013, she joined the University of Pardubice (Czech Republic) as a postdoctoral research fellow in electroanalytical chemistry. Since 2015, she has been working at the Centre of Materials and Nanotechnologies of the same university. Her research is focused on the anodization of valve metals towards novel nanotubular and nanoporous structures, as well as application and functionalization of these structures. She has over 40 publications that have been cited over 400 times, and her publication H-index is 14.

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Approaches about numerical simulation of surface engineering for some natural polymer fibrous system

Vrinceanu Narcisa
Lucian Blaga University of Sibiu, Romania

Surfaces of bamboo derived cellulosic fibrous systems have been modified by air-plasma treatment.

Their deformational response was studied to establish the relationship between their three-dimensional profile and permanent deformation as a measure of their comfort properties since the fibrous system made of natural polymer comes into contact with the skin. The composite should have a permanent deformation close to zero, in order to be, in terms of dimensions, as stable as possible. By analyzing the area of 1 cm^2 using a Universal Surface Tester (UST), different 3D surface diagrams and surface roughness values were obtained. This type of surface investigation provides relevant information about the permanent deformation response of the studied surface, for comfort purposes. The deformation responses and roughness levels were studied (the roughness being the parameter quantifying the 3D geometry of the systems surface). The effect of air-plasma surface modification on the deformation response of bamboo derived cellulosic fibrous systems and optimization of their 3D surface structure to enhance comfort-related properties proved to be substantial. The surface modifications induced by air-plasma treatment are in a good correlation with the mechanical behavior. As expected, the roughness levels of samples studied, using ball sensors are higher than those of specimens scanned using a papillary sensor. Knitted polymer fibrous matrix T1 shows a roughness level of 773 µm resulting from analyses using the ball sensor, while using the papillary sensor it was 102 µm, 86.8% less than before. The analysis of the dimensional stability of knitted polymer fibrous systems was performed by scanning with the papillary sensor, since it provides information comparable with human perception concerning the architecture of the sample surfaces.

Speaker Biography

Vrinceanu Narcisa has completed her PhD at the age of 30 years from "Gh. Asachi" Technical University of Iasi, Romania. She completed a post-doc programme of three years at "Al.I.Cuza" University of Iasi, Romania, in the field of Nanotechnology and Materials Chemistry in Environment Protection. She is working as Lecturer at "L.Blaga" University of Sibiu, Romania, with the main subjects: Textile Fibers Investigation, Garments Comfort, Textile Engineering, Conventional and non-standard Textile Finishing, Environment Chemistry, Transfer Phenomena, Basics of Chemistry. She has expertise in research-development-innovation projects at "L.Blaga" University of Sibiu, Romania. She has more than 200 publications that have been cited over 200 times, with an H-index of 6 and has been serving as an editorial board member of reputed Journals.

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