World Conference on

MATERIALS SCIENCE AND NANOTECHNOLOGY

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World Conference on

ENGINEERING, TECHNOLOGY AND APPLIED SCIENCE

Hosting Organization:
Eurasia Conferences, Kemp House, 152-160 City Road, London, EC1V 2NX

NOVEMBER 07

2022

BANGKOK, THAILAND

SCIENTIFIC PROGRAM

09:50-10:00 @ **Introduction, Welcome note and Conference Inauguration**
Conference Room: "Tubtib Room, 2nd floor"

NOVEMBER 07, 2022

Keynote Sessions

10:00-10:30	**Title: Towards Eco-sustainability and Circular Economy: Study of the Mechanical Properties of Recycled Polypropylene and Its Blends** **Tongsai Jamnongkan,** Department of Fundamental Science and Physical Education, Faculty of Science at Sriracha, Kasetsart University, Chonburi 20230, Thailand
10:30-11:00	**Title: Computational Nanomedicine: Predicting The Best Nanomaterials for Medicine** **Thomas J. Webster,** Interstellar Therapeutics, Boston, USA

Tea and Refreshments Break 11:00-11:20

11:20-11:45	**Title: Noble Metal Medium Entropy Alloy Thin Films by Atomic Layer Deposition** **Alfred Tok,** School of Materials Science and Engineering, Nanyang Technological University, Singapore 639798, Singapore
11:45-12:10	**Title: Multiscale investigations on the properties of recycled aggregate concrete modified by compression casting and nano-silica** **Biao Hu,** College of Civil and Transportation Engineering, Shenzhen University, Shenzhen, China

Speaker Sessions

12:10-12:30	**Title: Solution plasma synthesis of electrocatalytic carbon composite materials for oxygen reduction reaction** **Takahiro Ishizaki,** Department of Materials Science and Engineering, College of Engineering, Shibaura Institute of Technology, Tokyo 135-8548, Japan
12:30-12:50	**Title: Electrochemical paper-based analytical device (ePAD): benefits and limitations.** **Sirimarn Ngamchana,** BioSciences and Systems Biology Research Team, Biochemical Engineering and System Biology Research Group, National Center for Genetic Engineering and Biotechnology, National Sciences and Technology Development Agency at King Mongkut's University of Technology Thonburi, Bangkok, Thailand

Session Wrap 12:50-13:00

Lunch Break 13:00-14:50

13:50-14:10	**Title: Scanning Ion Conductance Microscopy for applications in nano-biotechnology** **Petr Gorelkin,** ICAPPIC Limited, London, The Fisheries, Mentmore Terrace E8 3PN, United Kingdom

	Title: Plasmatron for air plasma spraying of nitride coatings
14:10-14:30	**Rakhadilov,** B., Research Center «Surface Engineering and Tribology», Sarsen Amanzholov East Kazakhstan University, Ust-Kamenogorsk 070000, Kazakhstan
14:30-14:50	**Title: Hydrothermal treatment technology for wood-based biofuel production** **Naoto Shimizu,** Research Faculty of Agriculture, Field Research center for Northern Biosphere, Hokkaido University, Sapporo, Hokkaido, Japan
14:50-15:10	**Title: Effect of acid on fiber reinforced concrete produced with mineral admixtures** **Sadat Ali Khan,** Department of Engineering, Faculty of Engineering Science and Technology, The Maldives National University, Male', Maldives

Tea and Refreshments Break 15:10-15:30

15:30-15:50	**Title: Hydrogen Storage and Corrosion Characteristics of High Entropy Alloys and Composites** **J. Eckert,** Erich Schmid Institute of Materials Science, Austrian Academy of Sciences, Jahnstraße 12, 8700 Leoben, Austria
15:50:16:10	**Title: Structural Health Monitoring of fiber reinforced polymers** **Magdalena Mieloszyk,** Institute of Fluid Flow Machinery, Polish Academy of Sciences, Fiszera 14, 80-231 Gdansk, Poland
16:10-16:30	**Title: β phase PVDF induced by montmorillonite mixing and its anisotropic piezoelectric behavior** **Nelly Pons,** Karim Inal, Alain Burr, Séverine A.E. Boyer, MINES Paris, PSL University, Center for materials forming (CEMEF), CNRS UMR 7635, Sophia Antipolis, France

Session Wrap 16:30-16:45

Closing Ceremony

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ENGINEERING, TECHNOLOGY AND APPLIED SCIENCE

November 07, 2022 | Bangkok, Thailand

KEYNOTE PRESENTATIONS | DAY 1

Tongsai Jamnongkan
Department of Fundamental Science and Physical Education, Faculty of Science at Sriracha, Kasetsart University, Chonburi 20230, Thailand

Towards Eco-sustainability and Circular Economy: Study of the Mechanical Properties of Recycled Polypropylene and Its Blends

At the present, it is well known that plastic wastes, such as polyethylene and polypropylene, have numerous damaging environmental impacts, including increased energy consumption and greenhouse gas exhaustion. Thus, it has been a challenge in establishing a cost-effective method to solve these problems. Easily ways to effective approach might use natural resources, as called biomaterials, to replace their corresponding functional products. Additionally, upcycling or recycling plastic waste based on circular economy concept is also an effectively alternative ways for manage and reduce the plastic wastes on the environmental problems. This study is to develop alternatively upcycling polypropylene wastes with good performance and acceptable mechanical properties for various applications. The recycled polypropylene was successfully blended with their virgin polypropylene by using a melt-extrusion process. All samples showed good performance of mechanical properties. However, the modulus and tensile strength of virgin polypropylene slightly decreased with increases in the recycled polypropylene concentrations. The modulus and tensile strength of the virgin polypropylene were determined to be 1,317 MPa and 36.47 MPa, respectively. It was found that these values were slightly higher than those of their blended with recycled polypropylene. In contrast, it showed lowest of the elongation at the break, approximately 15.09%, when compared to their blends. Overall results indicate that the recycled polypropylene can be up to 40 wt% concentration for blending with their virgin without significantly changing the mechanical properties. Such compounds lead to a practical and economical recycled material with less environmental impact.

Biography:

Dr.Tongsai Jamnongkan currently serve as the associate professor in the Faculty of Science at Sriracha, Kasetsart University, Thailand. He obtained his PhD in Organic materials engineering (Polymer Engineering) from Yamagata University, Japan. His research interests mainly focus on biomaterials, material science and engineering, fiber materials processing, polymeric materials and composites, nanomaterials, biomaterials, nanofabrication, and testing, as well as polymer composites for electrical and biomedical applications.

Thomas J. Webster
Interstellar Therapeutics, Boston, USA

Computational Nanomedicine: Predicting The Best Nanomaterials for Medicine

While much attention has been paid to the experimental data using nanomaterials to prevent, diagnosis, and treat multiple diseases, recently there has been an upward trend towards using computational modeling to predict and understand the role that nanomaterials can play in medicine. This presentation will emphasize the role that computational modeling is playing in the integration of nanotechnology into medicine. Such computational modeling demonstrates that the dimension, chemistry, charge, crystallinity, etc. of nanomaterials can be predicted for optimal anti-infection, anti-cancer, anti-inflammatory, and pro-tissue growing applications. Studies will be highlighted where self-assembled nanomaterials were designed using computational modeling to attach to and kill SARS-CoV-2 (the virus that causes COVID-19), bacteria, and cancer cells. Studies will also be provided which predict the exact size of nanoscale surface features on implants to promote the growth of tissues, like bone, cartilage, vascular, and others. In this manner, this invited talk will summarize the role that computational modeling can play when coupled with in vitro and in vivo experiments to develop the best nanomaterials for medicine.

Biography:

Thomas J. Webster's (H index: 111; Google Scholar) degrees are in chemical engineering from the University of Pittsburgh (B.S., 1995; USA) and in biomedical engineering from RPI (Ph.D., 2000; USA). He has served as a professor at Purdue (2000-2005), Brown (2005-2012), and Northeastern (2012-2021; serving as Chemical Engineering Department Chair from 2012 - 2019) Universities and has formed over a dozen companies who have numerous FDA approved medical products currently improving human health. Dr. Webster has numerous awards including: 2020, World Top 2% Scientist by Citations (PLOS); 2020, SCOPUS Highly Cited Research (Top 1% Materials Science and Mixed Fields); 2021, Clarivate Top 0.1% Most Influential Researchers (Pharmacology and Toxicology); and is a fellow of over 8 societies.

Yiming Zou, Lin Jing, Leyan Wang, Huiting Chena, Ronn Goei, Yuanyuan Guo, Sidney Kwong Roong Yong, Amanda Jiamin Ong, Kwan Wee Tan & Alfred Tok

School of Materials Science and Engineering, Nanyang Technological University, Singapore 639798, Singapore

Noble Metal Medium Entropy Alloy Thin Films by Atomic Layer Deposition

Medium entropy alloy (MEA) thin films have attracted enormous research interests recently because of their superior physiochemical properties. However, the current fabrication methods (e.g., magnetron sputtering) encounter challenges such as thickness control, ratio tuning, high power consumption/cost, etc., especially for noble metal based MEAs. Therefore, a facile and low-cost synthesis method is highly demanded for tunable fabrication of noble metal MEA thin films. Herein, we developed a novel method by applying sequential atomic layer deposition (ALD) growth of noble metal layers, followed by electric joule heating (EJH) alloying process, which provided with ultrafast ramping/cooling rates to achieve alloying and recrystallization of MEA without phase separation. This two-step method bypasses the obstacle of merging different ALD temperature windows of all the involving metals. For the first time, noble metal-based MEA thin films with atomic control have been achieved. PtIrPd MEA thin film with a thickness of ~20 nm and atomic ratio of 35:35:30 was successfully fabricated, and these specifications can be precisely tuned by varying the ALD parameters. The effects of EJH temperature on the morphology and structure evolution was studied. This work opens more pathways for facile and tunable synthesis of MEA thin films based on diverse metals towards various applications.

Biography:

Associate Professor Alfred Tok is faculty member in School of Materials Science & Engineering (MSE) at Nanyang Technological University (NTU), Singapore. He studied Mechanical Engineering at Queensland University of Technology, Australia, and graduated with First Class Honours in 1995. After graduation, he worked as mechanical engineer at ST Aerospace Engineering in Singapore. In 1997, he was awarded 2 scholarships at NTU to pursue his PhD in Mechanical Engineering. His research areas focus on the processing and applications of inorganic materials in the areas of smart materials, biosensors & renewable / sustainable energy.

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Biao Hu, Zhi Liang, Yingwu Zhou*

College of Civil and Transportation Engineering, Shenzhen University, Shenzhen, China

Multiscale investigations on the properties of recycled aggregate concrete modified by compression casting and nano-silica

Improving and reusing recycled aggregate concrete (RAC) is an ideal approach to developing sustainability in the construction industry. In this paper, a newly proposed physical compression casting method was used in combination with a treatment of nano-silica (NS) particles to enhance the properties of RAC. Although using NS contributed to accelerating hydration, promoting pozzolanic reaction and increasing calcium-silicate hydrate gel, the enhancement in strength and reduction in porosity was found to be limited. Thus, the compression casting method was used to compensate for the weaknesses. The effects of compression casting, NS and their combinations on the properties of RAC were investigated. At the macro-level, the stress-strain responses were evaluated by examing the compressive strength, peak strain and modulus of elasticity. At the micro-level, the porosity and pore distribution along the interface transition zones (ITZs) were investigated using mercury intrusion porosimetry (MIP) analysis and scanning electronic microscope (SEM) imaging technology. Compared with normal RAC, the compressive strength achieved by using NS particles, compression casting and their combination were increased by 37%, 88% and 143%, respectively. The compression casting or combination of compression casting and NS particles treatment can effectively reduce the total porosity of the mortar and pore ratio along the ITZs.

Keywords: Recycled aggregate concrete, Compressed recycled concrete, Nano-silica, Interface transition zone.

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SPEAKER PRESENTATIONS | DAY 1

Solution plasma synthesis of electrocatalytic carbon composite materials for oxygen reduction reaction

Takahiro Ishizaki[1*], Kaito Fukushima[2], Kenichi Tanaka[2], Koudai Sasaki[2], Sangwoo Chae[3]

[1]Department of Materials Science and Engineering, College of Engineering, Shibaura Institute of Technology, Tokyo 135-8548, Japan
[2]Materials Science and Engineering, Graduate School of Engineering and Science, Shibaura Institute of Technology, Tokyo 135-8548, Japan
[3]SIT Research Laboratories, Shibaura Institute of Technology, Tokyo 135-8548, Japan

Theoretical calculations and experiments demonstrated that introducing nitrogen into carbon lattices could induce charge redistribution and result in the creation of the net positive charge on the adjacent carbon, which enhance the adsorption of O2 molecules and thus become an effective ORR catalyst.1-3 However, rational design of a new catalyst system based on nitrogen-doped carbon materials is still present intriguing challenges in ORR catalysis research. Herein, a new kind of nitrogen-doped carbon nanoparticle–carbon nanofiber (NCNP–CNF) composite with advanced ORR catalytic activity has been developed via solution plasma process. The carbon composite nanomaterials were synthesized by growing nitrogen-doped nanoparticles through 2-cyanopyridine (C6H4N2) on CNFs.4 This integration led to a unique morphological feature and modified physicochemical properties. Firstly, the incorporation of nitrogen atoms in the carbon composite nanomaterials synthesized was confirmed by various analysis and the nitrogen content of NCNP-CNFs was found to be approximately 1.35 atom %. SEM and TEM observation revealed that most of NCNPs attach to the CNF surface throughout almost area investigated, giving rise to a unique morphology with an interconnected porous structure. From linear sweep voltammetry (LSV), CNFs demonstrated a two-step reduction process with low current density whereas NCNP-CNFs showed a single-step wide plateau of higher limiting current density. The calculated electron transfer number of NCNP–CNF composite were estimated to be 3.21–3.51. The enhancement in ORR activity of NCNP–CNF composite can be attributed to the synergistic effects of good electron transfer from highly graphitized CNFs as well as abundance of exposed catalytic active sites originated from meso/macroporosity in NCNPs.

Acknowledgement: This work was supported by the Strategic International Collaborative Research Program (SICORP) grant number JPMJSC18H1, from the Japan Science and Technology Agency (JST), and a Grant-in-Aid for Challenging Research Exploratory (No. 21K18835) from the Japan Society for the Promotion of Science (JSPS).

References

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4. G. Panomsuwan, N. Saito, T. Ishizaki, ACS Appl. Mater. Interface, 2016, 8, 6962.

Biography:

Takahiro Ishizaki received his PhD degree from Waseda University, Japan in 2004. Presently, he is a professor in Department of Materials Science and Engineering, College of Engineering, Shibaura Institute of Technology, Japan. He served as a postdoctoral research associate at Nagoya University (2004–2006), as an assistant professor at the Nagoya University (2006–2007), and as a research scientist at Materials Research Institute for Sustainable Development, National Institute of Advanced Industrial Science and Technology (AIST) (2008-2012), Japan, respectively. His main research interests are surface modification on various inorganic materials and fabrication of functional energy materials.

Electrochemical paper-based analytical device (ePAD): benefits and limitations.

Sirimarn Ngamchana[1], Cristian F. Guajardo Yévenes[2], Chatuporn Phanthong[3] and Werasak Surareungchai[4]

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[2]Pilot Plant Development and Training Institute, King Mongkut's University of Technology Thonburi, Bang Khun Thian, Bangkok, Thailand

[3]BioSciences and Systems Biology Research Team, Biochemical Engineering and System Biology Research Group, National Center for Genetic Engineering and Biotechnology, National Sciences and Technology Development Agency at King Mongkut's University of Technology Thonburi, Bangkok, Thailand

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Faculty of Science and Nanoscience & Nanotechnology Graduate Program, King Mongkut's University of Technology Thonburi, 10140, Thailand

Analytical Sciences and National Doping Test Institute, Mahidol University Rachathewee, Bangkok, 10400, Thailand

Electrochemical paper-based analytical device (ePAD) research has been continuously growing since 2009, because of its unique properties of absorbing and delivering fluids by capillary action without the help of external forces, its ability to be used as disposable device, and its inexpensive cost. Electrochemistry is a promising technique for integration in paper-based devices, where interdigitated electrode arrays (IDA) stand out, due to their ability to enhance signals measured from analytes with a faster response.

In this research, we fabricated an IDA electrode by using screen printing technique. IDAs with two finger widths were fabricated: 288 μm ± 11 μm and 362 μm ± 8 μm in average. The effect of evaporation on the measurements was evaluated in three different environments: a closed box containing wet cotton, closed box without wet cotton and open-air environment. The results show that evaporation had little influence in the limiting current obtained by chronoamperometry when measuring in open-air environment. The limiting currents obtained by chronoamperometry for each environment were 1.37 μA ± 0.14 μA, 1.34 μA ± 0.12 μA and 1.39 μA ± 0.43 μA, respectively, when using an average finger width of 288 μm ± 11 μm. One-way ANOVA test revealed that these differences in average were not significant ($F[2, 27] = 0.11392$, $p = 0.89275$, when $F_{critical} = 3.3541$ and $\alpha = 0.05$). However, the time response obtained in an open-air environment was higher than the others. The time responses of chronoamperometric response in each environment were 19.73 s ± 1.47 s, 20.12 s ± 2.04 s and 25.09 s ± 5.40 s, respectively. We also tested the effect of electrode bending by comparing the limiting current and time response of chronoamperometric measurements with those of a straight IDA. The limiting current and time constant of straight and bent IDA were 1.37 μA ± 0.14 μA and 19.73 s ± 1.47 s, 1.35 μA ± 0.22 μA and 14.49±2.15 s, respectively. There were no differences in mean of limiting current ($F[1,18] = 1.6586$, $p = 0.2141$) and time constant ($F[1,18] = 3.5629$, $p = 0.0753$) for the cases of straight and bent electrode (when $F_{critical} = 4.4139$, $\alpha = 0.05$).

In conclusion, electrochemical paper-based devices are a good option for wearable sensors with high selectivity and sensitivity. The effect of solution evaporation in open-air environment is not much, if the electrode finger width is small enough to produce a fast response to reach steady state. The flexibility of paper allows device bending without any effect on electrochemical measurements.

Biography:

Position: Senior research assistant at BioSciences and Systems Biology Research Team, Biochemical Engineering and System Biology Research Group, National Center for Genetic Engineering and Biotechnology, National Sciences and Technology Development Agency at King Mongkut's University of Technology Thonburi, Bangkok, Thailand

Scanning Ion Conductance Microscopy for applications in nano-biotechnology

Petr Gorelkin[1,2], Alexander Erofeev[1,2], Vasilii Kolmogoreov[2], Pavel Novak[1], Christopher Edwards[1,3], Yuri Korchev[1,3]

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[2]National University of Science and Technology “MISiS”, Moscow, Leninskiy prospect 6, Russia
[2]Imperial College London, London, Du Cane Road W120NN, United Kingdom

The SICM probe a micro- or nanopipette is ideally suited for performing nanoscale assays on the cell surface. These include patch-clamp recording from individual surface structures, iontophoretic delivery of reagents, or pressure micro-application via the pipette to probe mechanical properties of the cell or to deliver reagents. Until now, these advantages of SICM have never been fully explored in such important preparations as brain slices or cell cultures with a complex surface topology because the requirement for a relatively flat specimen surface has been intrinsic to standard scanning probe techniques.

To circumvent these difficulties, we have developed "hopping-mode” ion conductance microscopy. This methodology allows us to image uneven and convoluted cell surfaces at high resolution by ensuring that the pipette always approaches the cell from above rather than ‘dragging’ along its surface. We can clearly resolve fine dendritic segments, even those “suspended” in space. In order to unambiguously identify synaptic connections, we combined this new imaging mode with fluorescence and nanomechanical imaging. Using this combined technique, we observed how the mechanical properties of single cells changed in the presence of drugs acting on various parts of the cytoskeleton.

We have successfully combined scanning nanopipettes with principles of electrophysiology, fluorescence microscopy, electrochemistry, electrophoresis, and electroosmosis to investigate single channels and receptors in cellular membranes, to deliver biomolecules to precisely defined locations in cell cultures, and to perform single cell analysis.

Biography:

Petr Gorelkin has a PhD degree in physics. He is working at National University of Science and Technology “MISiS” and is a cofounder of ICAPPIC Limited company producing and developing scanning ion conductance microscopes. The company has developed unique tools for non-destructive nanoscale topographic imaging and investigation of functional properties of living cells. "Smart" navigation of the nanopipette can be used for automated patch clamping and localised dosing for a wide variety of biomedical and drug discovery research. He has publications in Nature Communication, ACS Nano, Analytical Chemistry, Nanoscale and ect. His h-index is 11.

Plasmatron for air plasma spraying of nitride coatings

Rakhadilov, B.[1,3], Kengesbekov, A.[1,2], Sagdoldina, Zh.[1], Satbaeva, Z.[1,3], Dautbekov M.[3], Baizhan D.[1], Magazov, N.[1,3]

[1]Research Center «Surface Engineering and Tribology», Sarsen Amanzholov East Kazakhstan University, Ust-Kamenogorsk 070000, Kazakhstan;

[2]Institute for Composite Materials, Ust-Kamenogorsk 070010, Kazakhstan;

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The main methods for applying titanium nitride coatings are physical vapor deposition (PVD) and chemical vapor deposition (CVD) methods, however, traditional processes do not provide the required level of durability under severe wear conditions. Air Plasma Spraying (APS) can produce a quality coating for applications where high levels of wear resistance and layer hardness are required. The element that provides the necessary characteristics of powder coating spraying is the plasmatron. A lot of plasmatrons of different constructions have been developed in the world, each of them has its advantages as well as disadvantages. Basically, the sprayed material is fed into the plasma stream radially through the cathode fitting of the holder, which is located on the cut of the holder cathode, which negatively affects the coating quality and the material utilization coefficient, since the disperse materials to be sprayed are not heated uniformly.. To ensure heating of the sprayed material, the power of the plasmatron is increased, which reduces its service life. There is a scheme for feeding the carrier gas with powder downstream the plasma flow through the nozzle-anode cutoff, which allows for more efficient and uniform heating of the sprayed material, and also provides for additional stabilization of the arc discharge by the nitrogen carrier gas cutoff. The plasmatron was designed and made according to this scheme. Experimental studies on the spraying of TiN powder were carried out. We chose 12X18H10T (analog AISI 321) steel as the substrate material. We found that coatings applied with the developed plasmatron have a higher bonding strength and greater thickness, and porosity is 8% lower than that of coatings obtained by other methods of gas-thermal spraying.

This research has been funded by the Committee of Science of the Ministry of Education and Science of the Republic of Kazakhstan (Grant No. AP14972882)

Biography:

Rakhadilov Bauyrzhan Korabayevich (28.03.1988) - PhD in Technical Physics, associated professor, Director of PlasmaScience LLP, a specialist with a scientific background in the field of condensed matter physics and physical materials science. He published 5 monographs, 5 study guides and over 150 scientific publications including 83 articles in foreign publications included Thomson Reuters and Scopus databases, 25 certificates of authorships for the invention. Hirsch index according to scientometric Scopus base – 8 (Author's Scopus ID: 55539741700), Web of Science – 5 (Web of Science Researcher ID: AAD-3744-2020), Google Scholar – 10 (Google Scholar ID author: GfFHeuAAAAAJ). (In ORCID: 0000-0001-5990-7123).

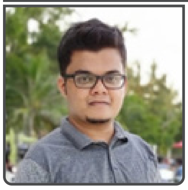
Hydrothermal treatment technology for wood-based biofuel production

Naoto Shimizu
Research Faculty of Agriculture, Field Research center for Northern Biosphere, Hokkaido University, Sapporo, Hokkaido, Japan

Sustainability is the basis of the Sustainable Development Goals (SDGs). One of the issues necessary to achieve these goals is to circulate agricultural waste materials, and the development of hydrothermal treatment technology for wood-based biofuel production that supplies second generation bioenergy from wood-based biofuel used hydrothermal treatment technology is one possible solution. In this lecture, we plan to talk about hydrothermal liquefaction of wood chips under supercritical and subcritical water reaction conditions. This subject is to confirm the suitable condition for producing 5-hydroxymethyl furfural (HMF), acetic acid and glycolic acid, and to investigate the influence of atmosphere and temperature on bio-oil production. Next is hydrogen generation from wood chips and biochar by combined continuous pyrolysis and hydrothermal gasification. This topic confirmed the optimal condition to produce syngas by conducting batch hydrothermal gasification (HTG) experiments. The biochar from pyrolysis is treated by HTG under optimal conditions to produce syngas. Find about the production of biofuels from wood chips by hydrothermal liquefaction and HTG. Specifically, there are the composition of the components, the optimum conditions by continuous bench-scale hydrothermal liquefaction, and the results of hydrogen and methane production using HTG.

Biography:

Naoto Shimizu, PhD, is Prof (Associate). in Agricultural Biosystems Engineering at Hokkaido University, Japan. He has published several book chapters and 74 journal articles. He regularly publishes the following journal with: Food Chemistry, Processes, Energies, Bioprocess and Biosystems Engineering, Environmental Control in Biology, SN Applied Sciences, Food Science and Technology Research etc.



Effect of acid on fiber reinforced concrete produced with mineral admixtures

Sadat Ali Khan
Department of Engineering, Faculty of Engineering Science and Technology, The Maldives National University, Male', Maldives

This investigation is an effort to assess the effect of acid on the fiber reinforced concrete (FRC) which is produced by partially replacing cement with mineral admixtures like ground granulated blast furnace slag (GGBS), fly ash and silica fume in varied proportions. The grade of concrete used is M20 with 2% of steel fibers. Test samples of FRC were casted by replacing cement with GGBS, fly ash and silica fume in varied proportions from 10% up to 30%. The test samples after curing were kept immersed in sulfuric acid solution of PH 2.0 for a period of 90 days. The difference in weight of the samples was checked and the samples were then subjected to compression, split tensile, shear and flexural strength tests and the results were compared with the conventional FRC. It was found from the investigation that the FRC which was subjected to acidic attack shown a reduced strength when compared to the FRC under normal conditions and this is the evidence that the acid has an adverse effect on concrete. Among the FRC samples produced with mineral admixtures, FRC with cement partially replaced by GGBS performs well when compared to those with fly ash and silica fume. The optimum percentage of cement replacement with GGBS was 20%, giving compressive, split tensile, flexural and shear strength as 20.57N/mm^2, 5.23N/mm^2, 12.5N/mm^2 and 12.0N/mm^2 respectively after acid attack. Adoption of this replacement technique will help producing cost effective concrete and reducing the impact of mineral admixtures on environment as well.

Biography:

Mr. Sadat Ali Khan currently working as Lecturer at The Maldives National University has done Masters in Structural Engineering from Visvesvaraya Technological University Belgaum, India. Mr. Khan has eight years of experience in teaching different subjects of Civil Engineering and has worked on revision and development of course structure for Civil Engineering degree program at The Maldives National University. Apart from this Mr. Khan has industrial experience in structural designing and site inspection of residential buildings. Research interests include Concrete technology, structural analysis and design and earthquake resilient structures. Mr. Khan has published several research papers in above mentioned areas.

Hydrogen Storage and Corrosion Characteristics of High Entropy Alloys and Composites

J. Eckert [1,2]

[1]Erich Schmid Institute of Materials Science, Austrian Academy of Sciences, Jahnstraße 12, 8700 Leoben,
[2]Department of Materials Science, Montanuniversität Leoben, Jahnstraße 12, 8700 Leoben, Austria, juergen.

This talk explores the hydrogen storage performance of multi-principal element alloys including high entropy alloys, single- and multiphase mixtures and composites synthesized using rapid quenching or powder metallurgy for tuning phase formation and microstructure development. The role of composition and nanostructuring will be critically assessed with respect to structural stability and evolution of hydrogen storage characteristics upon electrochemical and gas-solid reactions. Examples for composition fine-tuning and the role of grain boundaries on the storable amount of hydrogen and the uptake and release kinetics will be discussed and analyzed as ways to control the volumetric hydrogen uptake, the adsorption/desorption behavior and the tong-term cyclic stability of the material. Besides metallic systems, also examples for metal/polymer composites and membranes for hydrogen separation will be given, attempting to derive guidelines for how to tune phase formation, microstructure and properties of chemically complex multi-principal element alloys with optimized hydrogen storage properties.

Biography:

Jürgen Eckert is Director of the Erich Schmid Institute (ESI) of Materials Science of the Austrian Academy of Sciences and Chair Professor of Materials Physics at Montanuniversität Leoben, Austria. His main research interests are materials physics, metastable materials as well as design and synthesis of advanced high performance nanostructured materials for structural and functional applications. He is author of more than 1250 scientific papers and holds 24 patents in the areas of materials science and processing technology. He received numerous honors and awards, and is a member of several Scientific Academies.

Structural Health Monitoring of fiber reinforced polymers

Magdalena Mieloszyk
[1]Institute of Fluid Flow Machinery, Polish Academy of Sciences, Fiszera 14, 80-231 Gdansk, Poland

Fiber reinforced polymers (FRP) are commonly used in many industrial branches like aviation, marine or civil engineering. Therefore FRP elements are exploited in different environmental and loading conditions that influenced the durability of structures. The high popularity of FRP and safety requirements results in development of Non-Destructive Techniques (NDT) and Structural Health Monitoring (SHM), methods.

The material durability can be influenced by both mechanical damage types (e.g. crack, delamination) as well as contaminations (e.g. water, oil, dust) that can be introduced into elements structure during manufacturing process or can diffuse into its internal part during its exploitation. Such intrusions locally change material characteristics, affect its durability and can be a damage origin significantly decreasing mechanical properties of a FRP object.

FRP elements can be manufactured using traditional methods (like infusion method) or additive manufacturing (AM). During the AM process, sensors (e.g. fiber Bragg grating (FBG) sensors) can be embedded into the element structure to create a smart structure. Such an approach combines in one, advantages of AM (limited waste, elements with complex shape) and SHM system (safety, information about real loading conditions).

The presentation will be focused on applications of SHM and NDT techniques for a variety of FRP elements manufactured using traditional and AM methods.

Biography:

D.Sc., Ph.D., Eng. Magdalena Mieloszyk, prof. IMP PAN works at the Institute of Fluid-Flow Machinery in the Department of Mechanics of Intelligent Structures. She obtained a Ph.D. degree (2011) and D.Sc. degree (2019) in Mechanics. She participates in 15 national and 8 international projects, leader of 1 international and 2 national projects. Her scientific interests are mostly focused on: SHM and NDT methods, fibre optic sensors (especially fibre Bragg grating sensors) application for SHM of metallic and composite structures, THz spectroscopy for mechanical and physico-chemical damage detection, additive manufacturing (polymers and fibre reinforced composites).

β phase PVDF induced by montmorillonite mixing and its anisotropic piezoelectric behavior

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The piezoelectric functionality of polymers offers large applications, for instance Polyvinylidene Fluoride (PVDF) in its β phase. Under its thermodynamically stable crystalline phase (β phase), the molecular chains of PVDF are organized in a monoclinic network, linked to the TGTG' conformation. In the β phase, the network is orthorhombic, and the molecular chains are organized in the TTTT conformation. This phase can be obtained by mechanical stress, by blends with specific active fillers, and/or by application of an electric field during processing, inducing an orientation of the dipoles. This crystallization in β phase favors a strong mechanical anisotropy but also an electrical anisotropy. The latter is caused by the preferential localization of electronegative fluorines throughout the molecular chain, forming Hydrogen-Carbon-Fluorine dipoles.

This work wants to focus on the macroscopic scale. First to discuss the possibilities of fillers to dictate the (α to βphase) transition. Second, on β phase, to predict a certain number of quantities (such as the electric potential) by Finite Element calculation (FE-Abaqus) on the electromechanical coupling.

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Biography:

Nelly Pons is a fellow PhD candidate at Mines Paris (PSL University, Paris) under the supervision of Dr. Inal Karim and Dr. Lucien Laiarinandrasana. Her PhD research focuses on the control of the α to β phase transition of the PVDF to reach its best mechanical and piezoelectric anisotropic behaviors. In particular, this phase transition is conducted using additive manufacturing (FDM) and electric poling, predicted by numerical modeling. With her presentation at the WCMSN-2022, she discusses a new workflow that she developed to obtain and assess a fully oriented β-phase PVDF and its predictive behaviour.

Index