CONFERENCE PROGRAM

ICKEM 2023

THE 13TH INTERNATIONAL CONFERENCE ON KEY ENGINEERING MATERIALS

THE 5TH INTERNATIONAL WORKSHOP ON
MATERIALS AND DESIGN (MATDES 2023)

3.24-3.26 2023

Istanbul University, Istanbul, Türkiye

Sponsored by

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ICKEM2023

The 13th International Conference on Key Engineering Materials (ICKEM 2023)

2023 The 5th International Workshop on Materials and Design (MatDes 2023)

Istanbul University, Istanbul, Türkiye | March 24-26, 2023

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Türkiye Bilimler Akademisi
Turkish Academy of Sciences
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ONSITE

Address: İstanbul University, 34452, Beyazıt, Fatih, İstanbul, Türkiye
Room Information for signing: Rectorate Building, Doctorate Hall
Formal meeting room: Rectorate Building, Doctorate Hall

ONLINE

Online platform: ZOOM
zoom

Room A: 860 7105 9064
Link: https://us02web.zoom.us/j/86071059064

Room B: 825 4015 3889
Link: https://us02web.zoom.us/j/82540153889

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VENUE

Istanbul University, Istanbul, Türkiye

Add: Istanbul University, 34452, Beyazıt, Fatih, İstanbul, Türkiye

Formal meeting room: Rectorate Building, Doctorate Hall

How to get Istanbul University?

By Taxi

M2 By metro to Vezneciler

Google Maps

https://goo.gl/maps/3VRjnyDAVEFjdX3z9

Notice:

* The conference hotel or conference secretary will not contact any participant for reservation, please be careful when anyone asks you to provide your credit card information to book rooms for you.
* Accommodation is not included in the registration.

VENUE

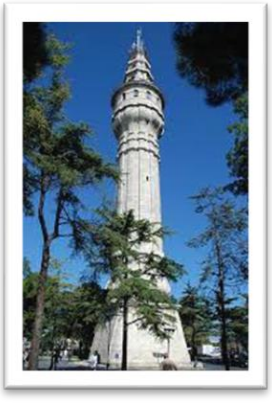
Istanbul University：

A prominent public research university located in Istanbul, Turkey. Founded by Mehmed II on May 30, 1453, a day after the conquest of Constantinople by the Turks, it was reformed in 1846 as the first Ottoman higher education institution based on European traditions. The successor institution, which has been operating under its current name since 1933, is the first university in modern Turkey.

At present, there are 66,487 undergraduate, graduate, and doctoral students studying in 33 academic units, including faculties, institutes, colleges, and vocational schools at 10 campuses. The main campus is adjacent to Beyazıt Square in Fatih, the capital district of the province, on the European side of the city.

Strict entry requirements (Some faculties require scoring among the top 1% of over 2 million applicants at the national university entrance examination every year) posit the University as one of the most prestigious in Turkey. Besides being a member of the Coimbra Group, the University took first place in Turkey and was globally placed in the top 500 according to the Academic Ranking of World Universities published in 2022.

Sights in Beyazıt



AGENDA OVERVIEW

*** All schedules will be scheduled in Istanbul Time (GMT+3)**

Day 1-March 24, 2023 | Friday		
Online Meeting| ZOOM		
05:00-12:00	Speakers' Test Session	ROOM A: 860 7105 9064 Link: https://us02web.zoom.us/j/86071059064
09:00-11:00	Online Sessions Test	Room B: 825 4015 3889 Link: https://us02web.zoom.us/j/82540153889

Day 2-March 25, 2023 | Saturday		
Onsite Meeting| Rectorate Building, Doctorate Hall		
08:00-09:00	Onsite registration	Rectorate Building, Doctorate Hall - I
9:00-12:00	Opening remarks & Keynote/Invited speech	Rectorate Building, Doctorate Hall - I
14:00-16:15	Invited speech & Onsite Session A	Rectorate Building, Doctorate Hall - I
14:30-16:30	Onsite Session B	Rectorate Building, Doctorate Hall - II
Online Meeting| ZOOM		
14:00-15:30	Invited speech & Online Session 1	ROOM A: 860 7105 9064 Link: https://us02web.zoom.us/j/86071059064
14:00-15:45	Invited speech & Online Session 2	Room B: 825 4015 3889 Link: https://us02web.zoom.us/j/82540153889

Day 2-March 26, 2023 | Sunday		
Onsite Meeting| Rectorate Building, Doctorate Hall		
10:00-11:45	Onsite Session C	Rectorate Building, Doctorate Hall - I
10:00-11:30	Onsite Session D	Rectorate Building, Doctorate Hall - II
Online Meeting| ZOOM		
10:00-11:45	Online Session 3	ROOM A: 860 7105 9064 Link: https://us02web.zoom.us/j/86071059064
10:00-11:45	Online Session 4	Room B: 825 4015 3889 Link: https://us02web.zoom.us/j/82540153889
13:00-15:00	Academic Visit	Short historical tour around Süleymaniye & Beyazıt area
		TUBA's İstanbul Office visit

WELCOME

It is our great pleasure to invite you to attend the The 13th International Conference on Key Engineering Materials (ICKEM 2023) with it workshop The 5th International Workshop on Materials and Design (MatDes 2023), which is held in Istanbul, Türkiye on March 24-26, 2023.

ICKEM&MatDes 2023 consists of eight sessions: Polymers, Composite Materials and Composite Structures, Nanomaterials and Applied Chemistry, Metallic Materials, Metal Working and Metal Matrix Composites, Material Physics and Materials for Electronic Components, Functional Materials and Biomedical Materials, Alloys, Electrochemistry and Applied Catalysis, Advanced Building Materials and Flame Retardant Materials and Structural Design, Manufacturing and Applied Mechanics. Since ICKEM2011 in Singapore, Key Engineering Materials has made new progress both in research and standardization. Prof. Alexander M. Korsunsky, Prof. Kwang Choy, Prof. Geoffrey Mitchell, Prof.Gennady Chitov, Prof.Armando Ramalho and Prof. Osman Adiguzel will give speeches on this conference. Many distinguished young scholars will also present their latest work. ICKEM&MatDes 2023 will provide a platform for the attendees to share and discuss thoroughly their creative ideas and even radical point views.

The conference is organized by the Biomaterials and Nanotechnology Research Group & BioNanoTeam, Istanbul University, Istanbul, Türkiye. We wish to express our sincere appreciation to all committee members and other individuals who have contributed to the ICKEM&MatDes in various ways!

İstanbul, formerly known as Constantinople, has a history of more than 7,000 years, is the largest city in Turkey, serving as the country's economic, cultural and historic hub. The city straddles the Bosporus strait, lying in both Europe and Asia, and has a population of over 15 million residents, comprising 19% of the population of Turkey. Istanbul is the most populous European city, and the world's 15th-largest city. The city attracts a large number of visitors from home and abroad.

We wish you a successful conference and enjoyable experience in Istanbul, Türkiye!

Conference Chair
Prof. Alexander M. Korsunsky,
Trinity College, Oxford University, UK

COMMITTEES

Conference Chair
Prof. Alexander M. Korsunsky, Trinity College, Oxford University, UK

Conference Co-Chairs
Prof. Zeki Candan, BioNanoTeam, Istanbul University, Türkiye
Dr. Fatih Uzun, University of Oxford, UK
Assoc. Prof. Ramirez-Castellanos Julio, Universidad Complutense, Spain

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Prof. Dr Joris Everaerts, KU Leuven, Belgium
Prof. Marco Sebastiani, Universitá Roma Tré, Italy

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Prof. Kwang Choy, Duke Kunshan University, China
Henni Ouerdane, Skolkovo Institute of Science and Technology, Russia
Prof. Carsten Gachot, Technical University Vienna, Austria
Prof. Pranut Potiyaraj, Chulalongkorn University, Thailand

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Prof. Cem Korkut, TÜBA
Prof. Mursel Dogrul, TÜBA

Scientific Committee
Prof. Xu Song, Chinese University of Hong Kong, China
Prof. Tea-Sung (Terry) Jun, Incheon National University, South Korea

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Prof. Gennady Chitov, Laurentian University, Canada
Prof. Marcelo Gaspar, Instituto Politécnico de Leiria,Portugal
Assoc. Prof.Marina Rynkovskaya, Peoples' Friendship University of Russia,Russia
Prof. Armando Ramalho,Instituto Politécnico de Castelo Branco,Portugal
Prof. Isaac Chang, Brunel Centre for Advanced Solidfication Technology, United Kingdom
Assoc. Prof. Andrzej Katunin, Silesian University of Technology, Poland
Dr. Enrico Salvati, University of Udine, Italy

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Asst. Prof. A Safonov, Skolkovo Institute of Science and Technology, Russia

Publicity Committee
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Assoc. Prof. Mary Donnabelle Balela, University of the Philippines,Philippines
Assoc. Prof. Ivy Colambo, University of the Philippines Los Banos,Philippines

DETAILED AGENDA

*** All schedules will be scheduled in Istanbul Time (GMT+3)**

March 24th, Friday

Online Test		
Committee & Speakers' Test Session **Room A: 860 7105 9064, Link: https://us02web.zoom.us/j/86071059064**		
Istanbul Time	**Presenter Local Time**	**Presenter**
5:00-05:15	22:00-22:15	Prof.Gennady Chitov
5:15-05:30	10:15-10:30	Prof. Kwang Choy
11:30-11:45	8:30—8:45	Prof.Armando Ramalho
Authors' Test **Room B:825 4015 3889, Link: https://us02web.zoom.us/j/82540153889**		
Istanbul Time	**Session 1**	**Session 2**
9:00-10:00	MG1-060, MG2-007-A, MG1-091, MG1-121-A	MG1-124, MG1-042, MG1-126, MG1-134, MG1-013
Istanbul Time	**Session 3**	**Session 4**
10:00-11:00	MG1-003, MG1-009, MG2-001-A MG1-1001-A, MG1-066, MG1-072, MG1-102-A	MG1-030, MG1-027, MG1-133, MG1-076, MG1-132, MG1-127, MG1-130

March 25th, Saturday

Opening Ceremony & Guest Speeches Onsite Meeting Room: Rectorate Building, Doctorate Hall Online Room A: 860 7105 9064, Link: https://us02web.zoom.us/j/86071059064	
Hosted: Prof. Zeki CANDAN, Istanbul University, Türkiye	
Istanbul Time	**Speakers**
08:00-09:00	Onsite Registration
09:00-09:10	**Opening Remarks**
	Prof. Mahmut Ak, Rector, Istanbul University, Türkiye
	Prof. Alexander M. Korsunsky, Trinity College, Oxford University, UK
09:10-09:50	**Speech I**

	Prof. Alexander M. Korsunsky, Trinity College, Oxford University, UK Editor in Chief, Materials & Design
	Speech Title: Operando micromechanics of materials
9:50-10:30	**Speech II**
	Prof. Kwang Choy, Duke Kunshan University, China
	Speech Title: Nanostructured materials and process innovations towards a sustainable future
10:30-10:50	Coffee Break (Venue: Outside Doctorate Hall)
10:50-11:20	**Speech III**
	Prof. Geoffrey Mitchell, Institute Polytechnic of Leiria, Portugal
	Speech Title: Digitalisation of Material Science – Improving Product Design in the Context of Industry 4.0
11:20-11:40	**Speech IV**
	Istanbul University, Türkiye
	Speech Title:
11:40-12:00	**Speech V**
	Prof. Artur Mateus, Director of CDRSP - IPLEIRIA, Portugal
	Speech Title: Printing Big: extrusion based processes, challenges and opportunities
12:00-14:00	Lunch Time

Onsite Sessions

Meeting Room	Istanbul Time	Speakers
Doctorate Hall - I	14:00-14:30	**Speech Ⅵ**
		Prof. Osman Adiguzel, Firat University, Elazig, Turkey
		Speech Title: Crystallographic Transformations and Temperature Deformation Relation in Memory Behavior of Shape Memory Alloys
	14:30-16:15	**Session A**: Structural Design, Manufacturing and Applied Mechanics
		MG1-097-A, MG1-125-A, MG1-135, MG1-128, MG1-051-A, MG1-142-A, MG1-129
Doctorate Hall - II	14:30-16:30	**Session B:** Functional Materials and Biomedical Materials
		MG1-054, MG1-136, MG1-117, MG1-090, MG1-080, MG1-131, MG1-074, MG1-119-A

Online Sessions

Meeting Room	Istanbul Time	Speakers
Room A: 860 7105 9064	14:00-14:30	**Speech Ⅶ**
		Prof.Gennady Chitov, Université de Sherbrooke, Canada
		Speech Title: String and brane orders in quantum materials: Routes to experimental exploration
	14:30-15:30	**Session 1:** Metallic Materials, Metal Working and Metal Matrix Composites
		MG1-060, MG2-007-A, MG1-091, MG1-121-A
Room B: 825 4015 3889	14:00-14:30	**Speech Ⅷ**
		Prof.Armando Ramalho, Instituto Politécnico de Castelo Branco, Portugal
		Speech Title: Measuring the dynamic elastic properties of anisotropic materials to characterize the mechanical behaviour of products manufactured by additive processes
	14:30-15:45	**Session 2:** Material Physics and Materials for Electronic Components
		MG1-124, MG1-042, MG1-126, MG1-134, MG1-013
18:30-20:00	Dinner Time	

March 26th, Sunday

Onsite Sessions

Meeting Room	Istanbul Time	Speakers
Doctorate Hall - I	10:00-11:45	**Session C:** Alloys, Electrochemistry and Applied Catalysis
		MG1-140, MG1-204-A, MG1-103, MG1-057, MG1-098-A, MG1-092, MG1-100-A
Doctorate Hall - II	10:00-11:30	**Session D:** Advanced Building Materials and Flame Retardant Materials
		MG1-096, MG1-104, MG1-123-A, MG1-106, MG1-095-A MG1-101
12:00-13:00	Lunch Time	

Online Session 3-4

Meeting Room	Istanbul Time	Speakers
Room A: 860 7105 9064	10:00-11:30	**Session 3:** Polymers, Composite Materials and Composite Structures

		MG1-003, MG1-009, MG2-001-A, MG1-1001-A, MG1-066, MG1-072, MG1-102-A
Room B: **825 4015 3889**	10:00-11:30	**Session 4:** Nanomaterials and Applied Chemistry
		MG1-030, MG1-027, MG1-133, MG1-076, MG1-132, MG1-127, MG1-130
12:00-13:00	Lunch Time	
Academic Visit		
Istanbul university	13:00-15:00	Short historical tour around Süleymaniye & Beyazıt area
		TUBA's İstanbul Office visit

ATTENDEE GUIDELINE

Oral Presentations Onsite

- Timing: a maximum of 15 minutes in total, including speaking time and discussion. Please make sure your presentation is well timed and arrive at the designated conference room 15 minutes earlier.
- You can use USB flash drive (memory stick) and make sure you scanned viruses in your own computer. Each speaker is required to meet her / his session chair in the corresponding session rooms 10 minutes before the session starts and copy the slide file (PPT or PDF) to the computer.
- It is suggested that you email a copy of your presentation to your personal inbox as a backup. If for some reason the files can't be accessed from your flash drive, you will be able to download them to the computer from your email.
- Please note that each session room will be equipped with a LCD projector, screen, point device, microphone, and a laptop with general presentation software such as Microsoft Power Point and Adobe Reader. Please make sure that your files are compatible and readable with our operation system by using commonly used fronts and symbols. If you plan to use your own computer, please try the connection and make sure it works before your presentation.
- Videos: If your Power Point files contain videos, please make sure that they are well formatted and connected to the main files.

Oral Presentations Online

- To effectively control the time and avoid some unexpected situations, it's advised to test your presentation ahead of time to make sure it can be proceeded normally.
- Each presentation is a maximum of 15 minutes in total, including Q&A, please make sure your presentation is well timed.

Link for all participants to download: https://zoom.us/support/download

Voice Control Rules during the Presentation

- The host will mute all participants while entering the meeting.
- The host will unmute the speakers' microphone when it is turn for his or her presentation.
- Q&A goes after each speech, the participant can raise hand for questions, the host will unmute the questioner.
- After Q&A, the host will mute all participants and welcome next speaker.

KEYNOTE SPEAKER

Professor and Fellow (em.), Trinity College, University of Oxford, UK
Editor in Chief, Materials & Design

Speech Title: Operando micromechanics of materials
Speech Time: March 25, 09:10-09:50(GMT+3)
Meeting Room: Rectorate Building, Doctorate Hall- I

Bio: Alexander Korsunsky is Professor of Engineering Science at the University of Oxford and Trinity College. He has given keynote plenaries at major international conferences on engineering and materials. He has developed numerous international links, including visiting professorships at Universitá Roma Tre (Italy), ENSICAEN (France) and National University of Singapore.

Prof Korsunsky published over 200 papers in scholarly periodicals on the subjects ranging from neutron and synchrotron X-ray diffraction analysis and the prediction of fatigue strength to micro-cantilever bio-sensors, size effects and scaling transitions in systems and structures.Prof Korsunsky plays a leading role in the development of large scale research facilities in the UK and Europe. He is Chair of the Science Advisory Committee at Diamond Light Source (DLS) near Oxford, UK, and Chair of the User Working Group for JEEP (Joint Engineering, Environmental and Processing) beamline at DLS. These activities expand the range of applications of large scale science to problems in real engineering practice.

Abstract

Abstract: The paper overviews the systematic use of operando studies to characterise materials deformation at multiple scales reaching down to (sub)micron resolution. Within the range of techniques employed for this purpose, the use of electron and ion microscopies and X-ray scattering and imaging play a central role due to their versatility and availability. Digital Image Correlation (DIC) offers a robust, scalable and universally applicable means of deformation analysis that allows the determination of overall and local strain from continuously recorded micrographs of material surface. Further extensions and refinements of this method allows advancing this approach to 3D mapping, both in terms of in-plane and out-of-plane surface displacements, and in terms of volumetric mapping of displacements based on tomographic imaging. The inhomogeneity of deformation and strain localisation represent essential insights needed to determine the onset of localisation and the progression towards failure. Wide Angle and Small Angle X-ray scattering (WAXS/SAXS) are powerful techniques of structure and deformation analysis across the scales. These methods will be demonstrated in application to a variety of materials including metals, ceramics, polymers and composites.

KEYNOTE SPEAKER

Prof. Kwang Leong Choy
Duke Kunshan University, China

Speech Title: Nanostructured materials and process innovations towards a sustainable future

Speech Time: March 25, 9:50-10:30(GMT+3)
Presenter Local Time：March 25, 14:50-15:30(GMT+8)
Room ID: 860 7105 9064

Bio: Kwang Leong Choy [D.Phil. (Oxon)., DSc, FIMMM, FRSC] is the Professor of Materials Science at Duke Kunshan University (DKU). Prior to this, she was a Professor of Materials Discovery and the Director of the UCL Institute for Materials Discovery at University College London (UCL). She is the recipient of Grunfeld Medal Prize and has given over 150 keynote papers/invited lectures and conference session Chairman. She is leading a multidisciplinary research team ranging from material scientists, chemists, physics, coating specialists, bioengineering, nanobiotechnology, and engineers. Her team is conducting cutting edge research and technology exploitation of high performance, eco-friendly and cost-effective processing of new nanostructured materials, nanocomposites and superthin/thin/thick films coated products for thin film solar cells, clean energy, energy storage, electrical, optoelectronics, environment, health care, and biomedical applications. She has secured and managed numerous multimillion pounds national and European flagship research programmes with extensive collaboration with academia and industry. She has also established multi-million pound state-of-the art nanomaterials, innovative thin/thick films processing and characterisation facilities.

Abstract

Abstract: This contribution presents an overview on the design and development of eco-friendly multifunctional nanostructured materials and sustainable methods for the fabrication of nanostructured materials for clean energy, engineering and healthcare applications. Emerging, scalable and eco-friendly non-vacuum based aerosol assisted chemical vapour deposition methods have been developed for the fabrication of such nanostructured and multifunctional films for creating high value added applications. The deposition mechanism and process controls will be discussed for the fabrication of such materials with well controlled structure and composition at molecular level. The sustainability of the fabrication process will be discussed. The effects of the deposition process on the structure and properties of the nanostructured materials will be presented.

KEYNOTE SPEAKER

Prof. Geoffrey Mitchell,
Institute Polytechnic of Leiria, Portugal

Speech Title: Digitalisation of Material Science – Improving Product Design in the Context of Industry 4.0

Speech Time: March 25, 10:50-11:20(GMT+3)
Meeting Room: Rectorate Building, Doctorate Hall- I

Bio: Geoffrey Mitchell is Professor and Vice-Director of the Centre for Rapid and Sustainable Product Development at the Polytechnic Institute Leiria in Portugal. Geoffrey Mitchell carried out his doctoral work at the University of Cambridge in the UK and subsequently held a post-doctoral fellowship at Cambridge and a JSPS Fellowship at Hokkaido University in Japan. Prior to his current position he was Professor of Polymer Physics at the University of Reading, UK and from 2005 he was the founding Director of the Centre for Advanced Microscopy at Reading. His research work bridges physics, biology, chemistry and technology and he is a Fellow of both the Institute of Physics and the Royal Society of Chemistry as well as the Royal Society for the Encouragement of Arts, Manufactures and Commerce.

Geoffrey Mitchell is passionate about direct digital manufacturing (DDM) which enables products to be manufactured directly from a digital design without the need for specialist tooling or moulds and the development of novel materials to support the emerging technologies. He is fascinated by the opportunities that arise from merging electrospinning in to the family of DDM technologies. He brings a wealth of experience working with polymer based materials both natural and synthetic. He is particularly interested in the scales of structure present in all materials and especially biopolymers. He has developed and made extensive use of x-ray and neutron scattering methods coupled to computational molecular modelling and electron microscopy techniques. He is a Visiting Member of the Medical Physics and Clinical Engineering Department of the Oxford Universities NHS Foundation Trust. He is the editor of a book "Controlling the Morphology of Polymers Multiple Scales " published by Springer in 2016.

Abstract

Abstract: The pace of transition from rapid prototyping to rapid manufacturing within the framework of Industry 4.0 has increased in recent years. Metal-based additive manufacturing is now quite widely deployed in the aerospace industry and in the tooling industry due to the significant weight savings which can be made using additive manufacturing and through topology optimization as well as the freedom in design. Plastic parts manufactured using 3D printing are now becoming more common place with the capability to produce large sized

plastic parts from a range of high-performance materials. There are now growing applications in dentistry and medicine. This increased rate of use of direct digital manufacturing to produce commercial products takes place within the backdrop of the major societal challenge of climate change. There is now an increased realization of the need to make wider use of sustainable materials in the manufacturing of products with a much -reduced carbon foot print.

INVITED SPEAKER

Prof. Artur Mateus,
Director of CDRSP - IPLEIRIA, Portugal

Speech Title: Title: Printing Big: extrusion based processes, challenges and opportunities

Speech Time: March 25, 11:40-12:00(GMT+3)
Meeting Room: Rectorate Building, Doctorate Hall - I

Bio: Artur Mateus is an Adjunct Professor of Mechanical Engineering Department, on Rapid Tooling and Manufacturing, at the Polytechnic of Leiria, since 1997. He is the Director of the Centre for Rapid and Sustainable Product Development at the Polytechnic of Leiria. He is member of the scientific and technological council of the Incubator for startups, OPEN (Marinha Grande – Portugal). Artur Mateus has a PhD in Polymer Physics from the University of Reading (UK), a MSc from the Technical University of Lisbon (Portugal) and a first degree in Mechanical Engineering from the University of Coimbra.

Abstract

INVITED SPEAKER

Prof. Gennady Chitov
Laurentian University, Canada

Speech Title: String and brane orders in quantum materials: Routes to experimental exploration
Speech Time: March 25,14:00-14:30(GMT+3)
Meeting Room: 860 7105 9064

Bio: Gennady Y. Chitov holds a Ph.D. degree from U. de Sherbrooke (Canada). He was a postdoc at Rutgers University (USA) and U. of Saarland (Germany) before joining the faculty at Laurentian University's Department of Physics (Canada) in 2004. Since 2021 he has been an adjunct professor at the Department of Physics of U. de Sherbrooke. He was a visiting professor at Southern Federal University (Russia), Karlsruhe Institute of Technology (Germany) and McGill University (Canada). His main research interests are in theoretical condensed matter and statistical physics.

Abstract

Abstract: In this presentation I will give a brief non-technical account of the recent theoretical research on the quantum phase transitions, such that the standard Landau theory does not work in a usual way. The systems in the focus of this work are quantum chains and ladders, which along with conventional locally-ordered phases, like ferromagnetic or an-tiferromagtetic, manifest also phases with exotic (hidden) topological orders. The latter are quantified by the string or brane order parameters. In addition, the distinct quantum phases are characterized by different numbers of the zero-energy Majorana edge states, or their absence.

The particular emphasis in the talk will be put on the observational predictions of the theory. Several tentative experiments in the chain or two-leg ladder materials and in the artificial optical lattices to detect the predicted phase transitions and non-local string and brane order parameters, will be discussed.

INVITED SPEAKER

Prof. Armando Ramalho,
Instituto Politécnico de Castelo Branco,Portugal

Speech Title: Measuring the dynamic elastic properties of anisotropic materials to characterize the mechanical behaviour of products manufactured by additive processes

Speech Time: March 25, 14:00-14:30(GMT+3)
Meeting Room: 825 4015 3889

Bio: Armando Ramalho holds a PhD degree in Mechanical Engineering completed at the University of Coimbra, Portugal, as well as a MSc in Mechanical Engineering from the Higher Technical Institute of the University of Lisbon. He currently works as an Adjunct Professor at the Polytechnic Institute of Castelo Branco, Portugal. He was a Professor at the Polytechnic Institute of Guarda and at the University of Coimbra. He was the Director of the School of Technology of the Polytechnic Institute of Castelo Branco for over twelve years. His current research efforts focus on fatigue of welded structures, design of parts obtained by additive manufacturing, as well as in simulation of mechanical and biomechanical systems using numerical models developed on finite element software.

Abstract

Abstract: The use of additive processes in the manufacture of prototypes and structural components, or machine parts, had a great growth in the last decade. The use of new materials adapted to the requirements of use, with environmental sustainability and enabling the production of complex geometries, has leveraged additive manufacturing processes.
The layer-by-layer slicing sequence of these manufacturing processes are prone to introducing anisotropy into the materials. The mechanical characterization of anisotropic materials through classical tests is not always the most suitable for this purpose, given the economic aspects, the time required, precision requirements and, sometimes, the technological difficulties of the tests. The ASTM E 1876 – 01 standard presents a method for determining the dynamic elastic properties of materials by impulse excitation of vibration, at room temperature. Although the presented methodology is specifically suitable for isotropic materials, it is also mentioned that the methodology can be adopted for the use of anisotropic and non-homogeneous materials, requiring in this case additional care in the interpretation of the results.
This speech will present the methodology adopted to obtain the dynamic Young's Modulus, Shear Modulus, and Poisson's Ratio by impulse excitation of vibration, of materials obtained by 3D printing. The obtained properties are used in the simulation of the mechanical behaviour of components under in-service conditions, through the finite element method.

INVITED SPEAKER

Prof. Osman Adiguzel,
Firat University, Elazig, Turkey

Speech Title: Crystallographic Transformations and Temperature Deformation Relation in Memory Behavior of Shape Memory Alloys

Speech Time: March 25,14:00-14:30(GMT+3)
Meeting Room: Doctorate Hall- I

Bio: Dr. Osman Adiguzel graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD- degree from Dicle University, Diyarbakir-Turkey. He studied at Surrey University, Guildford, UK, as a post doctoral research scientist in 1986-1987, and his studies focused on shape memory alloys. He worked as research assistant, 1975-80, at Dicle University and shifted to Firat University in 1980. He became professor in 1996, and he has been retired 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 Plenary Speaker, Keynote Speaker, Invited speaker, speaker or Poster presenter. 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 Speaker, Keynote Speaker and Conference Co-Chair organized by different companies in different countries.

Additionally, he retired at the end of November 2019, and contributed with Keynote/Plenary Speeches over 60 Virtual/Webinar Conferences, due to the coronavirus outbreak in two year of his retirement, 2020 and 2021.

Dr. Adiguzel served his directorate of Graduate School of Natural and Applied Sciences, Firat University in 1999-2004. He supervised 5 PhD- theses and 3 M. Sc theses. He is also technical committee member of many conferences. He received a certificate which is being 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.

Abstract

Abstract: Shape memory effect is a temperature dependent phenomenon exhibited by certain alloy systems called shape memory alloys. These alloys take place in the class of smart and advanced structural materials, with the response to the variation of temperature and external conditions. These alloys have dual characteristics called thermoelasticity and superelasticity. Shape memory effect is initiated 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 is called thermoelasticity.

This behavior is governed by crystallographic transformations, thermal and stress induced martensitic transformations. Thermal induced martensitic transformation occurs on cooling along with lattice twinning and ordered parent phase structures turn into twinned martensite structures.Twinned structures turn into detwinned martensitic structures with deformation by means of stres induced transformation. Lattice Twinning occurs in opposite directions, <110 > -type directions on the {110}-type plane of austenite matrix. Superelasticity is performed stressing and releasing in elasticity limit at a constant temperature in parent phase region, and shape recovery occurs instantly upon releasing. Superelasticity is governed by stress induced transformation, and ordered parent phase structure turns into the detwinned martensite structure with stressing. Superelasticity exhibit elastic material behavior but stressing and releasing paths are different at stress-strain diagram, and hysteresis loops refers to the energy dissipation. Twinning and detwinning processes can be considered as elementary processes activated during the transformations. Shape memory effect is performed in a temperature interval after first cooling and stressing processe, whereas superelasticity is performed mechanically in a constant temperature in parent phase region, just over the austenite finish temperature. Deformation at different temperature exhibits different behavior beyond shape memory effect and superelasticity.

Copper based alloys exhibit this property in metastable β-phase region, which has bcc based structures. Lattice invariant shear and twinning is not uniform in these alloys and cause to the formation of complex layered structures, depending on the stacking sequences on the close-packed planes of the ordered lattice.

In the present contribution; x-ray and electron diffraction studies were carried out on two solution treated copper based CuZnAl and CuAlMn alloys. Electron and x-ray diffraction exhibit super lattice reflections. Specimens of these alloys were aged at room temperature, and a series of x-ray diffractions were taken at different stages of aging in a long-term interval. X-Ray diffraction profiles taken from the aged specimens in martensitic conditions reveal that crystal structures of alloys chance in diffusive manner, and this result refers to the stabilization.

ONSITE SESSIONS

Session A

Structural Design, Manufacturing and Applied Mechanics

14:30-16:15(GMT+3), March 25th | Rectorate Building, Doctorate Hall - I

Session Chair: Prof.Osman ADIGUZEL, Firat University, Turkey

MG1-097-A 14:30-14:45	Characterization of 2D Material-based Cellular Structures Abdullah Solayman, Jing Fu, Juveiriah Ashraf, Vincent Chan, Rashid Abu Al-rub, Kin Liao Presenter: Kin Liao Khalifa University, United Arab Emirates We have developed a novel, facile, and scalable fabrication method for cellular structures using two-dimensional (2D) materials using additive-manufactured polymer-based triply periodic minimal surface (TPMS) as the initial sacrificial scaffold. Cubically symmetric structures of the polymer Gyroid were dip-coated in 2D material solution followed by drying and thermal etching of the polymer scaffold, resulted in a neat 2D material lattice of the TPMS structure. We have fabricated cellular solids of reduced graphene (rGO), Mxene, Molybdenum disulphide (MoS2), as well as heterogenous rGO/MoS2. Scanning electron microscopy (SEM) and micro computed tomography (micro-CT) were used to evaluate the morphology and size of the three-dimensional (3D) architectures. Thermo-electro-mechanical properties of these 2D material-based TPMS lattices of different densities were characterized. It is demonstrated that the hydrothermal-assisted fabrication process is adaptable for different architectures based on 3D printed scaffolds and thus has wide functional applications. In addition, some of the lattices were infiltrated with polydimethylsiloxane elastomer (PDMS) forming composites. And we have demonstrated their potential application as flexible, high-sensitive, and durable stress sensors.
MG1-125-A 14:45-15:00	Numerical simulation of the stereolithography process for ceramic 3D printing Daniil Egorov, Svyatoslav Chugunov, Oleg Rogozin and Dmitry Kolomenskiy Presenter: Daniil Egorov Skolkovo Institute of Science and Technology, Russia The geometric precision of ceramic green bodies produced by stereolithography is a concern for the ceramic additive manufacturing. In this study, a mathematical model of curing has been developed. A numerical simulation framework is proposed that integrates the coupled effects of three

	relevant physical mechanisms: light propagation through the heterogeneous matter, accounting the scattering phenomenon; conversion of the photopolymerizable ceramic paste; evolution of the mechanical properties upon solidification. The software calculates the degree of polymerization at each point of a layer-by-layer printed part and takes into account its effect on deformations and residual stresses of the manufactured green part.
MG1-135 15:00-15:15	Influence of plate thickness on the results of residual stresses determination by through hole drilling in orthotropic composites of different fiber orientation Sviatoslav Eleonsky, Dmitry Kazantsev, Alexander Korsunsky, Vladimir Pisarev, Eugene Statnik and Alexey Salimon Presenter: Eugene S. Statnik HSM lab, Center for Digital Engineering, Skoltech, Moscow, Russia The main questions, related to the residual stress characterization in composite orthotropic plates by through hole drilling, are considered. The values of hole diameter increment in principal anisotropy directions, obtained by electronic speckle-pattern interferometry on the external specimen's face, serve as the initial experimental information. Theoretical foundation of the approach follows from the analytical solution of S.G. Lekhnitsky, which describes a stress concentration along the edge of central open hole in rectangular orthotropic plate under tension in principal anisotropy directions. The transitional model, that is essential link for deriving residual stress components from initial experimental data, represents the unequivocally solution to the properly posed inverse problem. Firstly, validation of the transitional model with respect to prescribing obtained residual stress values to specific ply inside specimen ' s thickness is based on calibration experiments. They provide data for unidirectional and cross-ply composite plates of three different thicknesses. It is shown that the values of principal residual stress components for cross-ply composite material do not depend on plate thickness. This means that the transition model, which is based on the measurements of deformation response to through hole drilling on external plate face, can be reliably implemented for characterization of maximal residual stress values inherent in the middle plane of composite plate. The second confirmation of above conclusion resides in very good coincidence of real interferograms and corresponding artificial images, which are constructed by using experimentally derived principal residual stress components as initial data for numerical simulation. The analysis of influence of hole diameter value on the results of residual stress determination is performed for cross-ply and angle-cross-ply composites. It is shown that hole of diameter 3.2 mm provides the most reliable results
MG1-128 15:15-15:30	Topology optimization of rib patterns for freeform composite structure Anastasiia Moskaleva, Ivan Sergeichev, Alexander Safonov and Enrique Hernández-Montes

	Presenter: Anastasiia Moskaleva Skolkovo Institute of Science and Technology, Russia This paper presents an algorithm for the design of efficient and stable composite freeform shell structures. The design workflow combines form-finding, structural analysis, and optimization techniques. To illustrate it, the paper provides a case study of the design and optimization of carbon fiber-reinforced polymer shell. After form-finding of the the initial structural shape, topology optimization was conducted to develop the reinforcing rib pattern to increase its buckling resistance. The use of optimized rib layouts greatly increased the rigidity of the shell, which was confirmed by finite element simulations.
MG1-051-A 15:30-15:45	Increasing the Overall Efficiency in the Forging Process of a 42CrMoS4 Steel Product Uğur Emanetoğlu, Sena Meydan, Burak Bahat, Hakan Aydın Presenter: Hakan Aydın Birinci Otomotiv Sanayi A.Ş,Turkey Energy is the most critical resource for manufacturing. Improvement of continuing processes at manufacturing plants is an efficient way of decreasing the carbon footprint of the industry in terms of energy and raw material. This project is aimed to enhance the time and energy-intensive steps in the manufacturing of an individual product, thus leading to resource-efficient production. After conducting forging simulations more than 14% reduction of the raw material per product is achieved. When calculated, this solely achieves 20 metric tons of reduced CO2 emissions considering the annual production amount of that particular product. Moreover, 4 strikes from the forging process have been eliminated from an initial 6 strikes, causing roughly a 67% reduction in the electricity needed for the presses. Raw material consumption was further reduced for dies upon a 71% service life increase. In addition to environmental benefits, the project has led to a reduction of 69% in forging time. Another result was the improved quality of the product, which was a problematic issue to be solved. Laps (folds) and underfillings were observed rarely, as well as the need for crack detection and loading tests for each part was translated into intermittent inspections with the new die design. The outcomes of the project were energy and raw material efficiency, a more productive work environment, increased product quality, and enhanced design experience of the R&D facility. Keywords: Resource efficiency; Process optimization; Sustainable production; Hot-forging; 42CrMoS4 Steel; Product improvement
MG1-142-A 15:45-16:00	Multilayer composite materials produced by laser direct energy deposition M. Gushchina, O. Klimova-Korsmik, R. Mendagaliev, Y. Kuzminova, S. A. Evlashin, G. Turichin Presenter: Marina Gushchina

	Saint-Petersburg State Matine University, Institute of Laser and Welding Technology, Russia Additive manufacturing (AM) processes find wide application in various industries. AM industry development leads to the appearance of new applications and production areas. One of these areas is the creation of functionally graded materials (FGM). FGMs can be created using a variety of strategies, including building with gradient transitions from one material to another, interleaving similar and dissimilar materials, interleaving materials with gradient change of chemical composition, structural gradient, and building material with gradient transitions that include of three or more materials. One of the most studied additive manufacturing processes in this area is the Laser Metal Deposition process. An additional advantage of this method is the flexibility in controlling parameters, which makes it possible, depending on the formed structure, to obtain various properties in alloys based on titanium or iron. Thus, materials are created for specific operational tasks. For example, the blades of gas turbine engines experience impact loads in a certain direction. The alternation of materials with different properties provides a change in the work of impact, increases the energy required for crack propagation, thus increasing the performance of the product. The impact test results of deposited multilayer composite Ti-6Al-4V/CP-Ti for the KCU are 54.7, 78.7, and 60.1 J/cm2 depending on test direction. The combination based on martensitic steel 09Cr16Ni4Nb and austenitic steel 316L best indices of mechanical properties and coercive force were obtained, which shows yield strength 445.3MPa, tensile strength 605.3MPa, relative elongation 17.7% and coercive force 4218A/m The resulting materials have high mechanical and magnetic characteristics, which allow them to be used for creation of a new generation of electric motors.
MG1-129 16:00-16:15	Microstructural characterization of FeCrNiMoW high entropy alloy Yuliya Klychevskikh, Eugene Statnik, Alexander Ivannikov, Alexey Salimon and Alexander Korsusky Presenter: Yuliya Klychevskikh Skolkovo Institute of Science and Technology, Russia In present study investigation of powder metallurgy synthesized 35Fe-30Cr-20Ni-10Mo-5W high entropy alloy was conducted. Microstructural characterization was performed by means of scanning electron microscopy (SEM), electron backscatter diffraction (EBSD) and energy-dispersive X-ray spectroscopy (EDS). Phase composition of all specimens contain constituted of σ-, FCC, and BCC phases. EBSD analysis demonstrated that the most promising microstructure was obtained after 2.5 hours of mechanical alloying.

ONSITE SESSIONS

Session B

Functional Materials and Biomedical Materials

14:30-16:30(GMT+3), March 25th | Rectorate Building, Doctorate Hall - II

Session Chair: Prof.Rinlee Butch Cervera, University of the Philippines, Philippines

MG1-054 14:30-14:45	Electron Cyclotron Resonance Chemical Vapor Deposited Diamond-Like Carbon Thin Films with Various Acetylene Flow Rates for Heterojunction Solar Cells with Anti-Reflective Coating Tanawit Srisantirut and Toempong Phetchakul Presenter: Tanawit Srisantirut King Mongkut's Institute of Technology Ladkrabang, Thailand Diamond-like Carbon (DLC) films can be used as a protective and anti-reflective coating. This research was to use DLC films modified with acetylene gas in the range of 40, 45, 50, and 55 cc to study the film characteristics using the Raman technique. The D-peak and G-peak were approximately 1356±5 cm-1 and 1578 ±5 cm-1, respectively, and the surface was examined with FESEM photographs to determine surface smoothness. Following I-V curve analysis in the heterojunction cell assay, the DLC-coated cell at 45 cc had an increase in efficiency from 15.17 to 17.30 compared to the without coated DLC. It demonstrates its applicability in the field of anti-reflective coating. however, not always Film coated with a gas flow rate of 50 and 55 cc was less efficient due to oxidation caused by the destruction of the ITO layer.
MG1-136 14:45-15:00	Fabrication and microwave absorption properties of BaTiO3 -SrTiO3 – Ni0.5Zn0.5Fe2O4 polymer nanocomposites Ertuğrul Bülbül, Mehmet Safa Bodur and Zeki Candan Presenter: Ertuğrul Bülbül Yeditepe University, Turkey In this present work, barium titanate (BaTiO3), strontium titanate (SrTiO3) and nickel zinc ferrite (Ni0.5Zn0.5Fe2O4) were used to prepare electromagnetic wave absorption composite. Homogeneous polymer composites containing of BaTiO3 -SrTiO3 – Ni0.5Zn0.5Fe2O4 was produced by the physical mixing method. Surface morphology of polymer composites was characterized by scanning electron microscopy (SEM). Microwave absorbing and electromagnetic parameters were recorded by vector network analyzer (VNA).The influence of the ratio of nickel-zinc magnetic particles into the

	dielectric materials was studied. Microwave absorption properties of polymer composites were determined by complex permittivity measurement and the effects of the barium titanate, strontium titanate and nickel-zinc magnetic particles on the microwave absorption properties were examined in the frequency range of 2 – 16 GHz. Real and imaginary parts of complex permittivity and permeability were determined by reflection/transmission technique. The dielectric interactions between two different dielectric materials were investigated and the role of Ni0.5Zn0.5Fe2O4 ferrite in the composite has been explored. Results showed that The RL of absorber composites with thickness of 3.0 mm reached a maximum value of -9.47 dB in the frequency range from 2.00 to 16.00 GHz and demonstrated that the nanocomposites could be use as electromagnetic absorber.
MG1-117 15:00-15:15	Smart Materials: The Next Generation in Science and Engineering Mert Yildirim and Zeki Candan Presenter: Mert Yildirim Department of Forest Industrial Engineering, Istanbul University-Cerrahpasa, Istanbul, Turkey; Istanbul Gelisim University, Istanbul, Turkey; Biomaterials and Nanotechnology Research Group & BioNanoTeam, Istanbul, Turkey In recent years, fascinating developments in various areas of materials science have happened. Smart materials, also known as intelligent or stimuli-responsive materials, have attracted attention in science and engineering. Self-healing and shape-memory materials are the most popular and important kinds of smart materials. Self-healing materials have the ability to fully or partially repair their features and functionality after repeated damage. Self-healing materials are divided into two categories: intrinsic and extrinsic, as well as autonomous and non-autonomous. These materials have the potential to increase their lifetime while reducing maintenance costs. Shape-memory materials, on the other hand, have the ability to react to certain stimuli, such as temperature, pH, light, magnetic fields, and electric fields, and transform from a temporary shape to their original shape after exposure to these stimuli. Shape-memory alloys and shape-memory polymers have attracted the most attention and are widely used among all kinds of shape-memory materials developed. The two most important properties of shape-memory alloys are shape memory and superelasticity. Shape-memory polymers are gaining popularity because of specific benefits such as their high shape recovery rate, light weight, low density, high strength-to-weight ratio, high shape deformability, and readily tailorable glass transition temperature. Smart materials have a wide range of applications, including aerospace, automotive, biomedicine, and construction. The objective of this paper is to review current advancements in this area, with a focus on smart materials.
MG1-090 15:15-15:30	The nanomechanics of diatom silica exoskeletons Julijana Cvjetinovic, Sergey Luchkin, Nickolai Davidovich, Yekaterina Bedoshvili, Alexey Salimon, Alexander Korsunsky and Dmitry Gorin

	Presenter: Julijana Cvjetinovic Skolkovo Institute of Science and Technology, Russia Hierarchically structured natural objects provide a promising base for developing advanced hybrid materials and devices for a wide range of applications. Particularly high level of interest has recently been placed on diatom algae, eukaryotic unicellular microorganisms that represent a potential solution to the fundamental problems of bionics, specifically, the effective application of exoskeleton building principles to high efficiency engineering device fabrication. Developing hull engineering structures, in particular, requires a thorough understanding of the structural and mechanical characteristics of diatom frustules. The present study investigated the morphology, topography and mechanical properties of Coscinodiscus oculus-iridis diatom frustules using atomic force microscopy and scanning electron microscopy. The Young's modulus showed a decrease from the side to the center of the frustule, with the variance up to fivefold, demonstrating the deformation of the structure. Nanostructured siliceous exoskeletons (frustules) offer unique guidance for developing a new generation of nano- and microdevices for electronic, electromechanical, photonic, and other uses by revealing the underlying relationship in the structure-properties-function chain.
MG1-080 15:30-15:45	Castor oil-based gel containing calcium phosphate/sorbitan monopalmitate nanocomposite as proof of concept for tooth sensitivity treatment Nitiporn Thongnasan, Siripatsorn Maimansomsuk, Butsakorn Wattanataworn and Khrongkhwan Akkarachaneeyakorn Presenter: Khrongkhwan Akkarachaneeyakorn Kasetsart University, Thailand Desensitizing gel has been used increasingly to produce stable minerals and occlude exposed dentine tubules in order to eliminate dentine hypersensitivity. In this study, calcium phosphate particles were synthesized in different ratios in the presence of a mixture of sorbitan monopalmitate and castor oil at 60° C to generate water-in-oil emulsion, which was followed by gel formation. The rheological properties of the prepared gel samples were studied, and they showed weak gel behavior. The smallest particle size of calcium phosphate embedded in the gel sample was approximately 0.2 μm. This type of gel can release calcium and phosphate ions to initiate ion binding on the dental surface, thereby resulting in complete occlusion of the dentinal tubule approximately 10 h after the gel application. Moreover, cytotoxicity test revealed that the gel exhibited good compatibility with human cells at extract concentrations of <1 mg/mL. In conclusion, the most effective gel CO-SMP4 could be utilized for the production of tooth desensitizing gels meant for home use that can effectively alleviate dentine hypersensitivity.
MG1-131 15:45-16:00	Artificial Intelligence analysis of the sterilization effects on the mechanical properties of human cranial bones

	Iuliia Sadykova, Eugene Statnik, Andrew Marshintsev, Janna Semenova, Alexey Salimon and Alexander Korsunsky Presenter: Iuliia Sadykova Skolkovo Institute of Science and Technology, Russia According to the literature, the patient's own bone remains the optimal material for cranioplasty. Autografts have an undoubted advantage over competing plastic materials as full biological compatibility due to the absence of interstitial conflict and accessibility. By now, there is not a single artificial material that meets the requirements for the reconstruction of the skull in children because it is especially complicated when reconstruction is carried out in conditions of a growing skull. At the same time, the use of autograft is accompanied by the highest percentage of complications in the form of resorption and infection. The purpose of this study was to evaluate the big data obtained after nanohardness testing of an autograft bone to close skull defects after various preliminary treatments, including an optimized method of bone sterilization, to compare their measurements, and to evaluate the effect of the bone treatment on the mechanical properties. And due to the complexity hierarchical structure organisation of the bones, correlations between the preprocessing, structure, composition, and properties of materials are not obvious, Machine Learning techniques were applied to reveal the differences of scull bones after different types of preliminary treatment. So, after obtaining the principal mechanical properties of the human skull bone, was assumed if it is possible for Artificial Intelligence to predict the presence of the sterilization and the sex of the patient.
MG1-074 16:00-16:15	Effect of precursor particle size of NiO-YSZ electrodes in its physico-chemical and electrical conductivity properties for solid oxide electrochemical cells Cristine Mae Macalisang, Anna Karenina Dalabajan, Rinlee Butch Cervera Presenter: Rinlee Butch Cervera University of the Philippines Diliman, Philippines Electrodes play an important role in the overall performance of solid oxide electrochemical cells (SOC), such as for fuel cell or electrolysis cell applications. Desirable properties of the electrode include good morphological features with high electronic and ionic conductivity. In this study, in order to investigate the effect of precursor particle size on the microstructure and conductivity properties of nickel oxide and yttria-stabilized zirconia (NiO-YSZ), precursors were prepared with different particle sizes using a planetary ball mill via varying the milling speed and milling time. From the particle size analysis (PSA) of the milled samples based on the studied milling parameters, it was observed that the milling time had a significant effect on the resulting ball-milled samples as compared to the effect of the milling speed. However, upon sintering to obtain the NiO-YSZ electrode composites, the effect of milling speed, in terms of grain size, can be observed. From the XRD patterns, major peaks can be attributed to cubic phases of NiO and YSZ; however, traces of ZrO2 impurity peaks can be seen for the precursor

	sample with higher milling speed. SEM-EDX analyses support the more agglomerated morphology for the sample with longer milling duration and larger grains for those with higher milling speed. The obtained total bulk conductivities for the sample milled at 400rpm (10h) is about 1.27x10-1 S/cm and for the 400rpm (20h) is about 1.77x10-1 S/cm with Ea of 0.88 eV and 0.27 eV, respectively.
MG1-119-A 16:15-16:30	Production of dissimilar gradient materials using LMD technology Olga Klimova-Korsmik, Marina Gushchina, Ruslan Mendagaliev, Artur Vildanov and Gleb Turichin Presenter: Olga Klimova-Korsmik State Marine Technical University, Russia The joining of titanium and steel is complicated by metallurgical features of the interaction and a significant difference in the thermophysical characteristics between the materials. Due to the numerous phases formed in the molten zone, optimizing the phase composition of the joint becomes a challenging task. Laser metal deposition (LMD) technology, can be used to prevent the formation of a large number of brittle compounds by depositing intermediate gradient transitions. This article discusses various options for joining titanium and steel alloys using LMD technology.. As the first system of the gradient transition between titanium and steel, a mixture of molybdenum and bronze was used. Oxides and Cu3Ti2 intermetallide were found in the joint, which reduced the strength of the joint, a tensile strength was 175 MPa. As a second system of the gradient transition, a transition with intermediate layers of niobium and bronze was demonstrated. The tensile strength was 335.5 MPa. As the third system, the transition with intermediate layers of vanadium and a mixture of vanadium and bronze was demonstrated, the tensile strength was of 357 MPa. Thus, using the technology, dissimilar materials can be joined using functionally graded materials. At the same time, the obtained materials have satisfactory mechanical characteristics.

ONSITE SESSIONS

Session C

Alloys, Electrochemistry and Applied Catalysis

10:00-11:45(GMT+3), March 26th | Rectorate Building, Doctorate Hall - I

Session Chair: Lecturer.Adnan Syed,Cranfield University, UK

MG1-140 10:00-10:15	High-temperature molten salt Corrosion challenges for Energy Materials Adnan Syed Presenter: Adnan Syed Cranfield University, Cranfield, Bedfordshire UK A current challenge in concentrated solar power plants is corrosion with storing heat in molten salt to provide 24/7 renewable energy supply. This research aims to study optimisation of molten salt storage system through an understanding of the electrochemical interactions of the molten salt with the storage vessel materials. It is proposed to build a unique facility to measure electrochemical performance in molten salt at high temperature with a capability of testing multiple samples in parallel. This will allow rapid performance evaluation of material and coatings in simulated high temperature service environment. Corrosion failure of these plants is associated with initiation of cracking because of electrochemical interaction between phases in the metallurgical microstructure. This can give rise to local attack, leading to crack formation and ultimately, plant failure. By using these electrochemical methods, we can better understand the cracking mechanism. This ongoing project enables rapid and precise evaluation of energy materials degradation by measuring jointly and in situ the electrochemical performance of multiple samples within a molten salt as a function of temperature. The research will looking for further support by an international and multidisciplinary collaborators from the academic and industrial sectors. The topic is aligned well with the current global need of Carbon emissions reductions.
MG1-204-A 10:15-10:30	Achieving increased plasticity in high strength ultra-fine grained Al-Mg-Zr alloys A.M. Mavlyutov, T.S. Orlova, N.A. Enikeev, M.Y. Murashkin Presenter: Aydar Mavlyutov Ioffe Institute, Russia Nowadays the development of strong and at the same time ductile materials is the urgent task of materials science. In this work, we show possible ways to increase plasticity while maintaining a high level of strength in ultrafine-grained (UFG) Al-Mg-Zr alloys. The UFG structure was produced by high-pressure torsion.

	Different structural states were studied. The changes in the structure were implemented by deformation-heat treatment, including annealing and additional deformation. The magnesium content in the alloys varied in the range of 0.53 – 1.17 wt.%. The microstructure features, mechanical and electrical properties were investigated. As a result, the processing route leading to the best combination of strength – ductility properties has been revealed. Physical mechanisms for achieving increased plasticity are discussed. The authors gratefully give thanks to the Russian Science Foundation for financial support for the research (grant No. 22-19-00292).
MG1-103 10:30-10:45	Structure and Electrochemical Behavior of Coatings from Complex Concentrated Alloys Deposited by Metco Triplex Pro-210 gun Namratha Mulpuri, Dmitry Dzhurinskiy, Stanislav Dautov, Abhishek Babu, Artem Yakimchuk Presenter: Dmitry Dzhurinskiy Skolkovo Institute of Science and Technology, Russia Complex concentrated alloys (CCAs) have gained a significant attention in the engineering and research community due to their unique phase structure and exceptional properties. CCAs are usually comprised of five or more principal alloying elements mixed in near-equimolar or equimolar ratio, which can derive their qualities from multiple principal elements owing to cocktail effect. In this study, atmospheric plasma spraying system equipped with a Metco Triplex Pro-210 gun was used to deposit CCAs designed coating compositions onto SS-316L steel substrate. The microstructure, mechanical and electrochemical behavior of the developed (CoCrFeNiMnx) CCAs were analyzed and compared to commercially used WC-17Co (Diamalloy 2005NS) and NiCr-75Cr2C3 (Metco 81NS) coatings deposited by APS Metco Triplex Pro-210 cascading arc plasma spray gun. The experimental results confirm that using Metco Triplex Pro-210 it is possible to manufacture a CCA coating layers with lower porosity, excellent phase stability in compare to conventional thermal spray processes. Coating characterization also reveals that the CCA coating' grains experienced a significant amount of grain refinement as compared to those in as-received CCA feedstock powder materials due to the occurrence of shot peening effect and dynamic recrystallization caused by highly deformed splat boundaries during spraying process. The electrochemical results indicates that the CCA coatings have a lower corrosion rate in compare to its plasma sprayed counterparts.
MG1-057 10:45-11:00	Analysis of Waste Cooking Oil Biodiesel (WCO) Synthesis with TiO2 Impregnated CaO from Waste Shells Nano-Catalyst Norwazan Abdul Rahim, Mohd Rosdzimin Abdul Rahman, Khairol Amali Bin Ahmad, Abd Rahim Mat Sarip, Syafawati Hasbullah, Ameer Suhel Presenter: Norwazan Abdul Rahim National Defence University of Malaysia

	The development of clean and renewable energy sources has become crucial due to the rapid rise in crude oil prices, depleting fossil fuel reserves, and increase in environmental pollution caused by various industries. Due to this phenomenon, biodiesel has emerged as a renewable and eco-friendly alternative to conventional diesel fuel because it is non-toxic and biodegradable. Waste cooking oil (WCO) is one of the best resources in biodiesel production which it has high potential such as saving ecological systems, improving pollution, preventing food supplies and more economic. But this WCO cannot be used directly into diesel combustion due to their properties are not good as diesel fuel. Thus, it needs to be converted as biodiesel fuel. In biodiesel synthesis process, the catalyst for instance KOH, NaOH, HCL, H2SO4 etc. plays a significant role to increase their yield but also need a washing process. Currently, the synthesis of WCO biodiesel using CaO-TiO2 nanoparticles as catalyst could be an excellent alternative because it eliminates the biodiesel' s washing step and catalyst can be reused. Hence, the cost of biodiesel production will be reduced. CaO catalyst was produced by using waste cockle and sea snail shells as a cost-effective and environmentally friendly heterogeneous catalyst. In addition, TiO2 impregnated CaO nanoparticles also have been studied through the ultrasonication process for the improvement in thermo-physical properties of catalyst reaction. It showed that, the 15:1 ratio is the ideal ratio for conversion of biodiesel production for both catalysts, which are 99.52% by using CaO catalyst and 97.63% by using $CaO\text{-}TiO_2$ catalyst. Moreover, the average time reaction of biodiesel production is 150 minutes, equivalent to two and half hours. So, the usage of the catalyst may be reduced efficiently.
MG1-098-A 11:00-11:15	Thermal and electrical properties of additive manufactured polymer-boron nitride composite Julia Bondareva Presenter: Julia Bondareva Skolkovo Institute of Science and Technology, Russia The efficiency of electronic microchip-based devices is increasing every year, while their size is decreasing. This miniaturization leads to significant overheating of various electronic components such as power transistors, processors, and power diodes. They need to be cooled to increase the lifetime and reliability of the system. The problems of overheating encourage researchers to create various microdevices based on materials that provide efficient heat dissipation. One such promising material is a composite based on photopolymer mixed with boron nitride. In this work using digital light processing (DLP), a model of photopolymer radiator with different volume filling of boron nitride was printed. The thermal conductivity (κ) of the photopolymer/BN composite was measured in the temperature range 3-400K. It was shown that the absolute values of thermal conductivity (k) strongly depend on the concentration of boron nitride

	flakes. Coplanar interdigital capacitors polymer-coated with different volume fractions of boron nitride were also fabricated to evaluate their current-voltage characteristics. Ab initio calculations were performed to show the behavior and spatial orientation of BN flakes under the influence of an external electric field at the atomic level. The calculation results are in agreement with experimental observations.The results showed the promising use of composite material based on photopolymer filled with boron nitride, obtained by additive manufacturing in modern electronics.
MG1-092 11:15-11:30	High-Performance Li-Ion Battery Anode for Energy Storage Applications Kubilay Ozdemir, Yohan Dall'Agnese Presenter: Kubilay Ozdemir General Directorate of Mineral Research and Exploration, Turkey Due to their high energy density and long cycle life, lithium-ion batteries (LIB) are seen as promising power sources for mobile devices, electric vehicles, and energy storage systems. The closest energy density to the traditional internal combustion engine is seen in lithium-ion batteries. The anode and cathode determine the performance of lithium batteries. A search for changes has arisen in the anode materials that need high capacity. Silicon draws attention to this subject with its capacity value of approximately 4,200 mAh/g. In addition, silicon is an element that is both highly abundant and environmentally friendly. However, the commercial use of this element is limited by two disadvantages. The first one is the massive volume expansion of silicon of about 300%. This expansion creates a thick layer called the solid electrolyte interface (SEI), significantly reducing the efficiency and preventing the use of silicon as the sole anode material. Therefore, these volumetric expansions cause structural deterioration of silicon atoms and many negative properties, from loss of contact with the conductive collector to insufficient lithiation mechanism. In order to tolerate these problems, carbon-based materials are promising due to their high mechanical properties. In particular, graphene, in addition to its high mechanical properties, theoretically has the properties to meet the volumetric expansion of silicon without losing its electrical properties with its sufficient conductivity properties. The second disadvantage of silicon is its high cost. To solve the cost issue, a cheaper family member of silicon called silicon dioxide stands out with its promising specific capacity value of 1,965 mAh/g, as well as its high abundance and environmental friendliness.In this master's thesis study, it has been investigated whether an anode material with a similar performance can be obtained from silicon dioxide/graphene instead of silicon nanoparticles/graphene. The composite material was obtained by physically mixing graphene with silicon dioxide and polyvinylidene fluoride. The electrochemical properties of the produced anode were measured by cyclic voltammogram and galvanostatic charge/discharge techniques, and the structural properties were characterized by X-ray diffraction (XRD) and scanning electron microscope (SEM). As a result, this novel anode material with a

	capacitance value of 411 mAh/g and a CE of 88% has shown that silicon dioxide material can reach a higher capacity than conventional graphite anodes and has produced promising results for further researches.
MG1-100-A 11:30-11:45	Influence of the component’ s ratio, nature of the carriers, and preparation methods on the catalytic activity of NiO-based bioxide catalysts in the DRM reaction Elguja Kutelia, Kusman Dossumov, Gaukhar Yergaziyeva, Davit Gventsadze, Teimuraz Dzigrashvili, Nikoloz Jalabadze, Olga Tsurtsumia, Lilli Nadaraia, Manshuk Mambetova and Moldir Anissova Presenter: Lili Nadaraia Georgian Technical University, Georgia Progress in the development of Ni/NiO-based cheap bioxide catalyst systems with excellent activity and sustained stability is a key to the industrialization and commercialization of syngas production via DRM technology. Utilization of cheap and readily available DRM catalyst systems with the performance to maximally produce syngas is unambiguously related to the proper selection of micro/nano-porous support materials, the ratio of the components in the bioxide catalysts, and methods of deposition of active phase on the granulated carriers. The present research deals with the study of catalytic activity of a series of 3%NiO-based bioxide catalysts with different content of cobalt oxide and iron oxide modifiers synthesized by the capillary impregnation (CI), deep impregnation (DI), and solution combustion (SC) methods on the granulated synthetic γ-Al2O3 (as a reference) and natural clinoptilolite from Georgian deposit (as a trial) carriers. The developed 3%NiO-based bioxide catalyst systems’ samples were examined in the reaction of carbon dioxide conversion of methane in the $500 \div 850^{\circ}C$ temperature range at a constant reaction volume rate (1000h-1) and the ratio (1:1) between CO2 and CH4 in the initial reaction mixture.

ONSITE SESSIONS

Session D

Advanced Building Materials and Flame Retardant Materials

10:00-11:30(GMT+3), March 26th | Rectorate Building, Doctorate Hall - II

Session Chair: Prof.Rinlee Butch Cervera, University of the Philippines, Philippines

MG1-096 10:00-10:15	Geopolymer as a key material to utilize basic oxygen furnace slag (BOFS) as an aggregate Gulfairuz Kareken , Chang-Seon Shon , Aizhan Tukaziban , Nurtay Kozhageldi , Madiyar Mardenov , Dichuan Zhang , and Jong Ryeol Kim Presenter: Gulfairuz Kareken Nazarbayev University, Kazakhstan Basic oxygen furnace slag (BOFS) is the hard waste created when molten iron is treated in a basic oxygen furnace during the steelmaking process. Despite its good hardness and strength properties, the free lime (f-CaO) and free magnesia (f-MgO) in BOFS limit the utilization of BOFS as an aggregate used in construction applications due to the expansion characteristics of their hydration products. However, the interaction between f-CaO and f-MgO and free silicon (f-Si) that come from sodium silicate (Na2SiO3) in geopolymer concrete/mortar mixture can create stable substances like wollastonite (CaSiO3) and enstatite (MgSiO3), and the expansion issue in BOFS may be reduced. In this research, therefore, a total of 5 geopolymer mortar mixtures were designed: 4 geopolymer mortar mixtures that comprise a partial substitution of river sand (RS) with BOFS aggregate (25%, 50%, 75%, and 100%) and one control mixture (100% RS) with fixed parameters, which contain Na2SiO3 ratio of 1.5 with 10 Molarities of NaOH and the combined binder contents with 50% ground granulated blast furnace slag (GGBFS) and 50% ASTM Class F fly ash (FA). Then, the fresh and hardened properties of geopolymer mortar (GPM) mixtures were evaluated. Test results presented that increasing BOFS aggregate content up to 75% substitution of RS increases the GPM mixture’s relative flowability. However, the air content and setting time of the GPM mixture decreased with increasing BOFS aggregate content. For compressive and flexural strengths, the GPM mixtures containing BOFS aggregate had comparative strength or higher strength than that containing 100% RS. The GPM mixture with higher compressive strength showed higher shrinkage than other mixtures. Finally, regardless of water and 1M NaOH

	solution submersions, all GPM mixtures have less than 0.1% expansion value except for the mixture [25%RS-75%BOFS] submersed in NaOH solution.
MG1-104 10:15-10:30	Metallurgical Slag Wastes into Pervious Geopolymer Concrete Stabilized with CO2 Capture Saken Sandybay, Zarina Onopriyenko, Vladislav Galiulin, Umut Bakhbergen, Chang-Seon Shon, Dichuan Zhang, and Jong Ryeol Kim Presenter: Zarina Onopriyenko Nazarbayev University, Kazakhstan The sustainable development agenda in the construction industry requires the development of green materials. In contrast to ordinary Portland cement (OPC), geopolymer concrete (GPC) is considered an eco-friendly construction material since it consumes less energy for production and uses industrial by-products as raw materials. Pervious concrete, a special type of concrete made of binder and coarse aggregate with a small content of fine aggregates, is also considered environmentally friendly because it protects trees on an impervious surface by providing air and water touching the roots of trees. The previous concrete (PC) can also be made of alternative aggregates such as recycled concrete aggregate and steelmaking by-products. Therefore, this research developed pervious geopolymer concrete (PGC) using ground granulate blast furnace slag (GGBFS) as a binder and gap-graded basic oxygen furnace (BOF) slag aggregate of coarse and medium size with the addition of fine aggregate under the controlled water-to-binder and AAS/binder ratio. The properties of PGC were evaluated in terms of compressive strength, splitting tensile strength, and permeability. Mix design and testing variables include an aggregate combination of BOF slag aggregate and granite and CO2 curing time. Test results indicate that the obtained PGC mixtures tend to have lower tensile and compressive strength than OPC. However, the water permeability of the mixtures is high. An increase in the CO2 curing time of PGC also tends to decrease the strength and increase the permeability of the PGC. Further research that carefully considers the chemistry of geopolymerization reaction is required to obtain the PGC with desired properties such as the increase in both tensile and compressive strengths.
MG1-123-A 10:30-10:45	Colored Aluminium Metal-Matrix Composites: Technology and Properties I.I. Danilov, H. Adams Presenter: Ivan Danilov University of Bern, Switzerland Methods of staining materials such as pulverization or color anodizing are widely used in the production of applied materials. Also known examples of color materials, painted by embedding alloying components in its structure. This colored glass and colored ceramics. Technology for producing colored glass known for several millennia. A little over a younger technology of color

	ceramics. Their properties are deep enough and in details studied and used for the production of various products. What cant be said about the metalic materials and metalls. In the proposed work describes a method of coloring aluminum metal-matrix composite (AMMC). As well as a description of its structure and its basic properties. The colored material was obtained in laboratory melting furnace from Nabertherm. Three production stages: mixing, stir melting and heat treatment at high temperatures are allowed to vary the saturation and shades of color. The change an different process parameter are allowed the control of material properties. In addition to the staining is also the modification of the mechanical properties of the material.
MG1-106 10:45-11:00	Freeze-Thaw resistance and mechanical properties of UHPC reinforced with a lower amount of hybrid fibers Assem Kushzhanova, Moldir Raiymbek, Chukwuwike Mike Ogwumeh, Umut Bakhbergen, Chang-Seon Shon, Dichuan Zhang and Jong Ryeol Kim Presenter: Assem Kushzhanova Nazarbayev University, Kazakhstan Sustainable development is becoming critical in many industrial fields, including building materials. The rapid development of the construction industry in Kazakhstan requires construction materials having high-quality, low maintenance, and good durability. The main durability issue of construction material associated with Kazakhstan’ s severe climate is the volume change of water in concrete caused by the freezing and thawing (F-T) cycles, which threatens the material’ s strength and microstructure. Therefore, ultra-high-performance concrete (UHPC), a relatively new material with high compressive and tensile strength and improved microstructural properties, is suggested. Nevertheless, a limited number of researches have been done regarding the F-T resistance of UHPC. This research focuses on the effect of combining two types of fibers (steel and polypropylene (PP) fibers) on the compressive, flexural, and direct tensile strength and F-T resistance of UHPC. Test results indicated higher dosages of PP fiber in UHPC increased strength before exposure to F-T cycles. Adding PP fiber to UHPC led to more prolonged strains for each UHPC mixture. However, adding more steel fibers was beneficial for UHPC exposed to F-T cycles. Although mixtures with high steel fiber dosage presented a more brittle type of failure and lower strain values than mixtures with higher PP fiber dosage, the compressive, flexural, and tensile strength of UHPC mixtures containing higher steel fiber dosages increased after 90 F-T cycles. Relative dynamic modulus of elasticity (RDME), which is a common indicator of F-T resistance of concrete, tends to increase for all tested mixtures, with the highest values belonging to ones with higher steel fiber dosage. Hence, it is suggested that UHPC with higher steel fiber dosage is more beneficial in terms of the F-T resistance of UHPC.
MG1-095-A 11:00-11:15	Effect of Al Presence in the CrCoNiFeAl High-Entropy Alloy Synthesized via an In Situ Additive Manufacturing Technique

	Yulia Kuzminova, Stanislav Evlashin, Igor Shishkovsky and Pavel Krakhmalev Presenter: Yulia Kuzminova Skolkovo Institute of Science and Technology, Russia High-Entropy Alloys (HEAs) offer a unique approach to alloy design, allowing for the development of materials with new and improved characteristics. However, searching for the required composition can be time-consuming and require a large amount of energy. An alternative approach is to use Additive Manufacturing (AM) techniques, which allow for the in-situ synthesis of new alloys using metal powder blends, resulting in both a reduction in time and materials. The present study examined the CrConiFeAl (x = 0, 1.0, and 5.0wt%) HEA fabricated using powder bed fusion AM technique with a pre-mixed powder blend. It was found that the as-built alloys showed similar mechanical characteristics, but significantly changed following a heat treatment. For instance, the CrConiFeAl alloy with the highest aluminum content displayed a microstructure of 410HV in annealed state, versus 265HV in as-built state. The presence of aluminum affects the alloy microstructure; the four-component CrConiFe system representing the typical fcc structure of the printed alloy with elongated grains, while the CrConiFeAl alloy with even small aluminum content shows a more equiaxed grain microstructure. However, chemical composition analysis does not indicate homogeneous element distribution, which is one of the main challenges for the in situ printing application.
MG1-101 11:15-11:30	Evaluation of properties of energy-efficient geopolymer cellular concrete containing basic oxygen furnace slag aggregate Aizhan Tukaziban, Chang-Seon Shon, Gulfairuz Kareken, Nurtay Kozhageldi, Dichuan Zhang and Ong Ryeol Kim Presenter: Aizhan Tukaziban Nazarbayev University, Kazakhstan In north-western Kazakhstan, there is a higher demand for energy-efficient construction materials such as cellular concrete in the construction industry due to severe weather conditions. Moreover, construction industries in Kazakhstan are looking into developing new construction materials utilizing industrial by-products. Unlike blast furnace slag (BFS), utilization of basic oxygen furnace slag (BOFS) is limited due to its chemical composition and volumetric instability mainly caused by f-CaO and f-MgO. This study developed a total of nine energy-efficient geopolymer mixtures (3-normal geopolymer mixture and 6-geopolymer cellular concrete). Mix design variables included a partial substitution of river sand (RS) with BOFS aggregate (0%, 50%, and 100%) and three different percentages of a foaming agent (0%, 25%, and 50%). The properties of geopolymer mixtures were evaluated in terms of compressive strength, hardened density, expansion behavior, and thermal conductivity. Test results presented that replacing RS with 50% BOFS aggregates decreased compressive strength, while replacing sand with 100% BOFS aggregate led to

	increasing the strength regardless of the geopolymer mixture type. Geopolymer cellular concrete had lower compressive strength and thermal conductivity compared to the normal geopolymer mixture due to a higher porous cellularity structure and satisfied the threshold value of expansion due to converting f-CaO and f-MgO to CaSiO3 and MgSiO3 and absorbing the expansion stress by cellular structure.

ONLINE SESSIONS

Session 1

Metallic Materials, Metal Working and Metal Matrix Composites

14:30-15:30(GMT+3), March 25th | Zoom ID: 860 7105 9064

Session Chair: Prof.Marwa F Elkady, Egypt-Japan University for Science and Technology (E-Just), Egypt.

MG1-060 14:30-14:45	Effects of Cold Rolling and Heat Treatment on The Microstructure and Hardness of Pure Aluminium Abdul-Jaleel Mohammed, Ibrahem Maher, Masaaki Nakai, Mohamed A.H. Gepreel Presenter: Abdul-Jaleel Mohammed Egypt-Japan University of Science and Technology, Egypt This paper investigates the effect of cold rolling (CR) and heat treatment on the microstructure and microhardness of pure aluminium. The sample melted in the muffle furnace then casted in an open sand mould. The as-cast sample was then cold rolled to 50%, 70%, and 80% (50CR, 70CR and 80CR) reduction with a rolling mill. The as-cast and cold rolled (CR) samples were subsequently prepared for microstructure analysis with optical microscope. ImageJ software was used to measure the grain sizes. The 80CR sample was selected for annealing (Annealing will be referred to as heat treatment for the rest of the paper) in a tube furnace for 10, 30, 60, 120 and 240 minutes at 330OC, 350OC, 400OC and 450 OC. The microstructure was investigated for recrystallization and grain growth. XRD and XRF were used to determine the crystallographic phases and chemical compositions of the as-cast and heat-treated samples. Vickers microhardness test was conducted on the as-cast, as-rolled and heat-treated samples. The samples deformed, flattened and the grain sizes increased with increasing rolling reduction. After heat-treatment fine equiaxed grains were obtained with sizes less than 100 μ m. The microhardness results obtained corresponded with the microstructure and grain sizes observed in the as-cast, as-rolled and heat-treated samples. The microhardness increased with increasing cold rolling reduction because of work hardening. Recrystallization and grain growth is attributed to the reduction in microhardness of the heat-treated samples.
MG2-007-A 14:45-15:00	Antibacterial and Corrosion Resistance properties of ZnO Nanocoatings on Anodic Aluminum Alloy

	Weiwei He,Huirong Le Presenter: Huirong Le Tsinghua University, China Aluminum alloy is widely used in industry, transportation, daily use, aviation and other fields. However, the aluminum alloy itself does not have antimicrobial properties. Microorganisms can easily adhere and breed on the aluminum alloy, and then destroy its original oxide layer, which causes pitting corrosion on the surface. Moreover, if the aluminum alloy used in medical and public places is contaminated by microorganisms, it will bring potential risks such as cross-infection. Especially, under the influence of COVID-19, the problem of cross-infection cannot be ignored. Therefore, it is of great practical significance to make aluminum alloy antimicrobial. In this paper, zinc oxide nanoparticles (ZnO NPs) were decorated on anodized alumina film by sol-gel method. First of all, a porous alumina film is formed on the surface by anodic oxidation. Then, soak the aluminum alloy in a mixed solution of zinc chloride and urotropine for two hours. Finally, anneal at different temperatures for an hour. Antibacterial experiments show that the antibacterial rate of aluminum alloy with ZnO NPs against Staphylococcus aureus is over 98.70%, and the antibacterial rate of sample annealed at 500℃ against Escherichia coli is over 99.67%. The morphology of the surfaces was studied by means of a scanning electron microscope (SEM) analysis. We found flaky or nano-spherical ZnO particles turned into nanowire-shaped ZnO particles on the sample annealed at 350 ° C, and nano-spherical ZnO particles on the sample annealed at 450 ° C. It is believed that the antibacterial properties of ZnO NPs may be derived from the damage of ZnO NPs to cell wall and cell membrane, the generation of reactive oxygen species leading to apoptosis and the toxicity of zinc ions released by ZnO NPs.
MG1-091 15:00-15:15	Evaluation of reinforcement distribution of Al6061/TiC composites by computed tomography Omer Furkan Ersoz, Turker Turkoglu, Sare Celik Presenter: Ömer Furkan Ersöz Balıkesir University, Turkey In this study, Al6061/TiC (4-8-12 wt%) composites were produced by hot pressing method. Composites were analyzed along the entire cross-section with a computer-assisted tomography device (Micro-CT). It was determined that the TiC distribution was appropriate in all reinforcement ratios. Porosity values were determined both experimentally and by Micro-CT and finally the results were compared. An increase in porosity values was detected with increasing reinforcement ratio in the composites, and both experimental and Micro-CT based results were founded as consistent
MG1-121-A 15:15-15:30	Influence of compressive strain rate on mechanical properties of unidirectional fiber reinforced plastic Stepan Konev and Ivan Sergeichev

Presenter: Stepan Konev
Skolkovo Institute of Science and Technology, Russia

We present results of experimental studies of dynamic deformation and failure of unidirectional carbon fiber reinforced plastic T700/LY113 under compression. The test samples were made by the method of filament winding of flat plates. To establish the strain rate dependences of the strength and elastic modulus of the material, the dynamic tests were carried out using a drop tower and split Hopkinson pressure bar methods, and standard static tests. The samples were loaded in the directions along and across the reinforcing fibers. The applicability of the obtained samples for static and dynamic tests is confirmed by results of finite element modeling and high-speed imaging of deformation and failure of samples during testing. As a result of the conducted experimental studies, static and dynamic stress - strain curves, time dependences of deformation, stress and strain rate of samples during compression were obtained. Based on these results, the strain rate dependences of the strength and elasticity modulus in the range of strain rates 0.001-600 1/s are constructed. It is shown that the strain rate significantly affects to the strength and deformation characteristics of unidirectional carbon fiber under compression – an increase in strength and elastic modulus under loading in the direction along the fibers 42% and 50%, respectively, across the fibers 58% and 50%. The average strength along fibers at highest strain rate was about 1000 MPa. The results obtained can be used to design of structural elements made of polymer composite materials operating under dynamic shock loads, as well as to build models of mechanical behavior and failure criteria of such materials taking into account the strain rate effects.

ONLINE SESSIONS

Session 2

Material Physics and Materials for Electronic Components

14:30-15:45(GMT+3), March 25th | Zoom ID: 825 4015 3889

Session Chair: Asst. Prof. Mohamed Orabi Moustafa, The American University in Cairo (AUC), Egypt

MG1-124 14:30-14:45	Terahertz conductivity of iron oxide-graphene oxide composite pellet Danell Jeune Nagal, Al Jerome Magsino, Joshua Castro, Arvin Lester Jusi, Mae Joanne Aguila, Elmer Estacio and Alvin Karlo Tapia Presenter: Danell Jeune Nagal University of the Philippines Los Banos, Philippines Electrical and optical characteristics of materials are the most commonly used physical properties that serve as tools to identify and analyze certain dynamics of matter being studied. In this paper, the optical parameters of iron oxide-graphene oxide composite mixed with polyethylene were characterized using terahertz time domain spectroscopy (THz-TDS) and impedance spectroscopy. The real and imaginary conductivities were obtained from impedance measurements in the low frequency range. The complex refractive index and absorption coefficient were also determined using THz-TDS. From these quantities, the complex conductivity of the sample was determined and was fitted using the combined Drude-Smith and Lorentz model.
MG1-042 14:45-15:00	Molecular Dynamics Study of Buckling Behavior of Wavy Vertically Aligned Carbon Nanotube Bundles Aghyad Al Tahhan, Mohammad Alkhedher, Abdel-Hamid Mourad, Jalal Nawash Presenter: Aghyad Belal Al Tahhan Abu Dhabi University, UAE Experiments have yielded various reports on the deformation behavior of Vertically Aligned Carbon Nanotube bundles under compression. However, a decisive conclusion is still to be explored as various factors influence bundles' deformation behavior. In this study, we employ Molecular Dynamics simulations to investigate the influence of waviness, temperature, and bundle size on the bundle’s buckling behavior under axial compression. It is established that the induced waviness along the structure of the bundles can significantly reduce the

	collective load-carrying capacity of the bundle regardless of its size. Furthermore, we explore the influence of atmospheric temperature on buckling propagation within the Vertically Aligned Carbon Nanotube bundles.
MG1-126 15:00-15:15	THz Time-Domain Spectroscopy and Imaging of Heated Commercialized Rubber Arvin Lester Jusi, Melvin Castrosanto, Anton John Rocha, John Paolo Ramoso, Elmer Estacio and Alvin Karlo Tapia Presenter: Arvin Lester C. Jusi University of the Philippines Los Baños, Philippines Rubber has various applications in automobile, household, ducting applications, and other industrial purposes. Commercialized rubbers are now proliferated and accessible to many users. Testing of such kinds of materials is essential for public information about safety and quality assurance. In this work, commercially available rubber sheets were cut into a circular shape. The samples were heated in a vacuum oven from 100-200 ° C. The THz spectra of the samples were measured using a THz Time-Domain spectrometer. THz imaging was also done to determine the morphological changes in rubber upon heating. THz analysis showed that the THz absorbance of rubber increased with heating temperature. This is attributed to the degradation and physical changes that took place. This was confirmed by the THz images which showed regions of varying densities created due to phase changes within the sample.
MG1-134 15:15-15:30	Optimized Synthesis of Polymer-decorated AgNPs for Colorimetric Detection of Copper Ions in Water Jem Valerie Perez, Edgar Clyde Lopez, Jeanette Vivien Jalalon, Mary Faith Delas Alas, Cheska Mae Aldana and Marlon Mopon Presenter: Jem Valerie Perez University of the Philippines Diliman, Philippines There is a rising concern over the presence of heavy metals in water due to their toxic nature. Although current methods of heavy metal detection are accurate, highly selective, and sensitive, they also require tedious preparation procedures, expensive equipment, and professional assistance. Hence, there is a need to develop a fast, portable, reliable, and inexpensive method that enables on-site detection of heavy metals. Herein, polymer decorated AgNPs were used as an assay-based nanosensor for the detection of copper ions in water. AgNPs were decorated with chitosan crosslinked with polyethyleneimine using glutaraldehyde to make them more stable. The composition of the PD-AgNPs was optimized by varying the CS, GLA, and PEI concentrations using a Box-Behnken design. Response surface analyses showed that a reduced cubic model is sufficient to model and predict the Φ and LOD of PD-AgNPs with 95% confidence. Numerical optimization revealed that the optimum formulation comprises of 1.1642 wt.% CS, 0.8298 wt.% GLA, and 1.3687 wt.% PEI. The predicted Φ = 82.5559 and LOD = 2.1566 mg L-1 agrees well with our validation experiments (actual Φ = 82.9540 and LOD = 2.2498 mg L-1).

MG1-013 15:30-15:45	The anisotropy and friction effect in the design of 3D printed PLA parts – a case study Armando Ramalho, Dino Freitas and Henrique Almeida Presenter: Armando Lopes Ramalho Polytechnic Institute of Castelo Branco, Portugal Additive Manufacturing, commonly known as 3D Printing, is one of the most affordable manufacturing processes for producing complex geometric components. This manufacturing process is also frequently used when it is needed to manufacture unique parts to replace degraded or damaged components and spare parts that are no longer available. In this reverse engineering process, particular attention must be given to the constitutive models of materials. The 3D printing manufacturing process usually requires a change of materials and introduces or increases the anisotropy. In addition, the complexity of part geometries and loading often requires using the finite element method to simulate their behaviour in service. Polylactic acid (PLA) is one of the materials frequently used in 3D Printing for its sustainability, affordability, and mechanical and thermal properties. In this study, a bushing of a hinged drawer support is reverse-engineered and its in-service behaviour is simulated before it is manufactured utilising tough PLA material through 3D printing. Furthermore, the effect of the anisotropy and the friction in the design is evaluated. The MSC Patran/Nastran 2021 software for the finite element analysis, the Ultimaker Cura 5.0 software and the Ultimaker S5 printer were used.

ONLINE SESSIONS

Session 3

Polymers, Composite Materials and Composite Structures

10:00-11:45(GMT+3), March 26th | Zoom ID: 860 7105 9064

Session Chair: Assist. Prof.Reymark De Mesa Maalihan, Batangas State University, Philippines

MG1-003 10:00-10:15	High Molecular Weight Cellulose Acetate Membrane Electrospinning: Parameters Experimental Optimization Noha M.Sayed , H. Noby , Kyaw Thu, A. H. El-shazly Presenter: Noha M.Sayed Japan university of science and technology, Egypt Cellulose acetate drawn great efforts in membrane fabrication field, as it is a biodegradable polymer. Although, electrospinning of CA with high molecular weight, which affects the spinnability, still a challenge. In this study, CA, with a relatively high molecular weight, was electrospun at different conditions to produce uniform and bead-free fibers. The effects of varying electrospinning parameters such as dope solution concentration, applied voltage, tip-to-collector distance, and flow rate on fiber diameter and electrospinnability of CA were investigated. The morphological structure and the average fiber diameter of the prepared membranes were analyzed using SEM analysis, and ImageJ software. Results revealed that the average fiber diameters ranged from 366 to 800 nm. In addition, the average fiber diameter increases from 366 to 665 nm with increasing CA dope solution concentration (11-17%). However, applied potential and tip-to-collector distance have not significantly impacted average fiber diameter. At the end, raising the CA molecular weight drop down the initial concentration (15 wt. %) could be used for bead-free and uniform fibers which safe the CA amount could be used for the membrane preparation.
MG1-009 10:15-10:30	Various Waste Polystyrene for Useful Membrane Fabrication: Comparative Experimental Study Salma Tarek Ghaly, H. Noby, J.-i. Hayashi, and A. H. El-shazly Presenter: Salma Tarek Abdelwahab Ghaly Egypt-Japan University of Sceince and Taechnology(E-JUST), Alex, Egypt Plastic waste recycling is drawing great attention to prevent the harmful effects resulting from the accumulation of plastic waste, especially as an integrated

	waste-to-product process. This study introduced a comparative study of two polystyrene (PS) wastes for polymeric membrane fabrication. Two types of polystyrene wastes, transparent and white-coloured, used for yoghurt packaging, were utilized. The commercial PS membrane was also fabricated for comparison. Polystyrene membranes were prepared by a non-solvent induced phase separation (NIPS) method. The prepared membranes were characterized by Fourier-transform infrared spectroscopy (FTIR), scanning electron microscope (SEM), measurements of contact angle (CA), porosity, and pore size distribution. According to the results, the prepared membranes showed an asymmetric structure with a blocked skin layer. Also, the prepared membrane surfaces were partially hydrophilic. Increasing polymer concentration (from 10 to 18 wt.%) enhanced the structural homogeneity of the membrane by obtaining smaller pores. On the other hand, the membranes' porosity decreased with the rise in the polymer concentration. Measurements highlighted the successful fabrication of similar membrane characteristics using two types of PS wastes, making them vivid candidates for water desalination and gas separation applications.
MG2-001-A 10:30-10:45	Designing Biocomposites Using a Perception-based Approach Manu Thundathil, Ali Reza Nazmi, Bahareh Shahri, Nick Emerson, Tim Huber Presenter: Manu Thundathil University of Canterbury, New Zealand With the increasing relevance of sustainability as a core pillar for the manufacturing industry, there is a renewed focus on the design of sustainable materials suited for mass production. Amongst the frontrunners in the race for replacing fossil-based materials, biobased composites stand out owing to their natural credentials. Reflecting this advantage, extensive research is conducted on making these materials stronger, cheaper and scalable; so that they can meet the functional properties offered by fossil-based materials. However, we believe that beyond solving the technical handicaps of biobased composites, it is crucial to examine the perceptual handicaps of these materials as well. The struggle of these materials in gaining market share after decades of scientific research may point to this. Commercial biocomposites today lack a distinct material identity, as the focus has been put on replacing and emulating synthetic materials. This misdirected perception of biobased composites leads to a decline in aesthetic appreciation, valuation and desirability amongst product designers and consumers. We propose that along with functional design, sustainable materials should undergo perception-based design as well. While there have been studies on material perception, few have focused on designing novel materials evoking desirable perceptions. The ability to meet and exceed consumer expectations from material experiences would be a critical factor in the wider acceptability of biocomposites. We used the semantic differential method to study the

	correlations between various material characteristics (visual and tactile) with perceptual attributes such as beauty, naturality and value in biocomposites. It is seen that factors like visual complexity, rhymic patterns and fibreness correlate with the perceived beauty of the biocomposites, while warm colours, organic patterns and fine surface texture correlate with naturalness. The perceived value of biocomposites is seen to associate with characteristics like micro-roughness, surface hardness, visual consistency and aspect ratio of fibres. Understanding these factors and their influence on various perceptual qualities would help material engineers and designers to create more distinct biocomposites which possess a higher chance of adoption. This perception-based approach would also help product designers to choose appropriate materials that align with product segments and desired user experiences.
MG1-1001-A 10:45-11:00	Deterioration study of retrieved UHMWPE tibial insert with a life span under 15 years Veronica Manescu (Paltanea), Iulian Antoniac, Aurora Antoniac, Gheorghe Paltanea, Marian Miculescu, Ana Iulia Bita, Stefan Laptoiu, Marius Niculescu, Alexandru Stere, Costel Paun, Mihai Bogdan Cristea Presenter: University Politehnica of Bucharest, Romania University Politehnica of Bucharest, Romania Total knee arthroplasty (TKA) is the treatment of choice in the case of knee osteoarthritis. One of the most important failure causes in TKA is due to the wear and oxidation processes of the ultra-high molecular weight polyethylene (UHMWPE). It is well known that prosthesis longevity is usually affected by fatigue, wear, oxidation, and other degradation mechanisms. Devices retrieved during revision surgery give valuable material and implant performance information. In the paper, we investigated the wear and oxidation processes of four UHMWPE tibial inserts retrieved from patients from Clinical Hospital Colentina, Bucharest, Romania. The average survival time of retrieved devices was ten years. In order to estimate the surface degradation and structural performance of the samples, we used light stereomicroscopy and scanning electron microscopy (SEM). Fourier-transform infrared spectroscopy (FTIR) was applied for quantification of the oxidation process in UHMWPE. Oxidation index computation consists of normalizing the area associated with the carbonyl vibration, placed at 1720 cm-1 with the area of the peak centred around 1370 cm-1 linked to the crystalline phase of the polymer. Using light stereomicroscopy and SEM investigations, six of the seven modes of surface degradation such as burnishing (M1), scratching (M2), pitting (M3), surface deformation (M4), delamination (M5), and wear (M7) were identified. Embedded material debris (M6) such as human bone or poly(methyl methacrylate) were not put in evidence. The Hood index was computed, and a variation between 7 and 32 was found. Regarding the oxidation process of

	the polymer, we have computed an oxidation index between 1.33 for a reference sample and 9.66 obtained for a retrieved sample.
MG1-066 11:00-11:15	On the 3D printing and flame retardancy of expandable graphite-coated polylactic acid Reymark D. Maalihan, Lucia Isabelle B. Briones, Ericka P. Canarias, Graciella P. Lanuza Presenter: Reymark Maalihan Batangas State University, Philippines In this study, we made a flame-retardant coating layer composed of expandable graphite (ExG) (carbon source), ammonium polyphosphate/boric acid (acid source), melamine (blowing agent), and epoxy/amine resin/hardener system (binding agent). At varying ExG amount, the coating was deposited onto the surface of 3D printed polylactic acid (PLA) by dip coating method. The fire resistance performance of 3D printed PLA was measured in terms of burning rate and burning duration. Surface morphology and thermal stability of the coated samples were investigated by scanning electron microscopy (SEM) and thermogravimetric (TGA) analysis. Residual char after burning was also analyzed by Fourier transform infrared (FTIR) spectroscopy and X-ray diffraction (XRD) analysis. Addition of 9.8 % w/w ExG in the coating formulation showed good adhesion and increased fire resistance of PLA. The coated specimens exhibited high thermal stability, increased residual weight and enhanced surface structure by TGA and SEM analysis. Lastly, FTIR and XRD results revealed the presence of graphite and boron phosphate in the residual char.
MG1-072 11:15-11:30	A Review of the Performance of Polyolefin (XLPE) Insulation and Factors Influencing Changes in its Properties Reylina Tayactac, Mark Christian Manuel and Allysa Mariel Ortiz Presenter: Reylina Tayactac Mapúa University, Philippines In today's world, the use of products made of crosslinked polyethylene (XLPE) is critical. The total share of polyethylene accounts for more than 40% of the entire commercial plastics market [1]. Polyethylene is the most widely used because of its low cost and ease of processing. However, at high temperatures, simple polyethylene loses its physical properties, limiting its application. The crosslinking of polyethylene is done to preserve the desired properties of the material while also acquiring new qualities [1]. XLPE is the densest of polyethylene materials and has superior technical and operating properties due to its polymer base and molecular structure. XLPE has several distinct properties, including thermal resistance, durability, chemical resistance, and resistance to stress fracture, low dielectric losses, high resistance to microorganisms, and many others, which have allowed its products to be used in the majority of modern human activities [2]. This study

	aims to review the performance of crosslinked polyethylene (XLPE) insulation and factors influencing changes in its properties during the service.
MG1-102-A 11:30-11:45"	Multifunctional Interleave Manufactured from Industrial Carbon Nanotubes Masterbatch Biltu Mahato, Stepan V. Lomov and Sergey G. Abaimov Presenter: Biltu Mahato Skolkovo Institute of Science and Technology, Russia Fiber reinforced composites are used in increasing quantities in various application including aerospace, automotive, lightweight structures, and many more because of their excellent in-plane strength and stiffness to mass ratio. However, they suffer from poor out-of-plane properties, which result in delaminations in service either from impacts, external loadings, or manufacturing defects. Delamination reduces the strength and stiffness of the laminate and affects the overall performance of a composite structure, possibly leading to a catastrophic failure. Due to this, recently a lot of interest has been received in developing a modification method to address the delamination problem with a possibility of self-diagnostic and in-situ damage monitoring. These modifications may be of micro- or nanoscale. In this research, a nanoscale modification with industrially available carbon nanotubes (CNT) masterbatch is explored to solve the identified problem of delamination and perform self-diagnostic and in-situ damage monitoring of glass fiber reinforced polymer (GFRP) composite laminate. Compared to conventional methods of introducing CNT into laminate, the application of industrially available masterbatch is scalable so that it is useful for large composite structures. A CNT interleave produced by diluting the CNT masterbatch is placed in between the plies to delay the delamination of laminate. The interleave is produced by painting the diluted masterbatch on the glass fiber prepregs. The laminate was produced by the hot press of the prepreg. Two types of CNT interleaves with a CNT content of 0.6 wt% and 7.5 wt% were produced. The 0.6 wt% interleave has a detrimental effect of ~80% on Mode I initiation and propagation fracture toughness. Whereas, the 7.5 wt% interleave shows an improvement of 27% in initiation and 0.5% in propagation fracture toughness. The R-curves for base and modified laminates are also presented. The addition of CNT interleaves turns unconductive GFRP into a conductive laminate and hence, can be used for self-diagnostics of damage. In-situ damage sensing tests were performed by simultaneously measuring the 2-wire resistance of sample during the double cantilever beam (DCB) test. The self-diagnostics damage sensing capability of laminates with both kinds of interleaves is presented. The 7.5 wt% interleave is richer in randomly oriented CNT compared to 0.6 wt% interleave. Addition of such randomly oriented CNT rich interleaves adds new toughening mechanism like CNT pull out and crack deflection, causing higher fracture toughness.

	Hence, addition of CNT interleaves manufactured from industrial masterbatch enhances the fracture toughness and adds new functionality of conductiveness in the GFRP, which can be used for self-diagnostic of damage of GFRP structures.

ONLINE SESSIONS

Session 4

Nanomaterials and Applied Chemistry

10:00-11:45(GMT+3), March 26th | Zoom ID: 825 4015 3889

Session Chair: Assoc. Prof. Ivy Razado-Colambo,University of the Philippines Los Baños, Philippines

MG1-030 10:00-10:15	Optimized Electrospun Polycaprolactone Bio-Membrane for Water Distillation Mostafa M. Sayed, Hussien Noby, Abdelrahman Zkria, Tsuyoshi Yoshitake and Marwa Elkady Presenter: Mostafa Mahmoud Sayed Ahmed Chemical and Petrochemicals Engineering, Egypt-Japan University of Science and Technology, Alexandria, Egypt Eco-friendly biodegradable polycaprolactone (PCL) membranes were fabricated at different polymer concentrations via the electrospinning technique. The membrane's fiber and average pore diameters of various fabricated nanofiber membranes were measured using SEM associated with ImageJ software. The polymer concentration of 10 wt.% showed beaded nanofibers compared with 12, and 14 wt.% showed bead-free nanofiber structures. Accordingly, the morphological structure, hydrophilicity, chemical structure, and mechanical properties of the two uniform nanofiber membranes of 12 and 14 wt.% were compared. The analyses demonstrated that the prepared 12 wt.% PCL membrane recorded the most uniform average nanofiber diameter and pore diameter of 328 nm and 0.45 μm, respectively. The contact angle of this fabricated nanofiber was recorded as 118.8°, suggesting its suitability as a hydrophobic membrane for membrane distillation. The PCL membrane's performance in a direct contact membrane distillation (DCMD) system was examined. The membrane showed increased flux that reached about 41.9 kg/m2h-1 and salt rejection (>94%) at 50 °C feed inlet temperature,10 °C permeate temperature, 6 L/h feed flow rate, and 10,000 ppm NaCl feed inlet concentration.
MG1-027 10:15-10:30	Synthesis and Characterization of Hydroxyapatite derived from Waste Chicken Eggshells for Cyanide Removal Application Fritz Z. Ortigas, Arianne Joy A. Batallones, Elizalde Miguel S. Flores, and Francis Eric P. Almaquer Presenter: Fritz Z. Ortigas University of the Philippines Visayas, Philippines

	In the present study, hydroxyapatite (HAp) was synthesized from waste chicken eggshells using wet chemical precipitation method. The entire process involved the conversion of raw chicken eggshells to calcined form to finally HAp via precipitation. The functional groups in the synthesized sample were determined by Fourier Transform Infrared Spectroscopy (FTIR) analysis. HAp was also characterized using Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS) to describe its morphology and elemental composition. The potential of HAp for cyanide removal in aqueous solution was further investigated via batch adsorption experiments with 3 x 2 factorial experimental design to determine the effects of initial cyanide concentration and HAp dosage in the removal efficiency. The highest percent removal was 50.31% attained at 64 mg L-1 cyanide concentration and 0.3 g HAp dosage after a 30-min contact time with solution pH maintained within the range 8.5-9.5. Two-way ANOVA results show significant main and interaction effects of the varied factors to the cyanide removal efficiency at 95% confidence level.
MG1-133 10:30-10:45	Sorption of methyl orange molecules on polyacrylonitrile-coated kapok fibers in a fixed bed set-up at dynamic conditions Wayne Christian P Datiles, Aimee Lorraine M Blaquera, Neil John F Catapang, Marvin U Herrera, Ronniel D Manalo, Monet Concepcion Maguyon-Detras, Mary Donnabelle L Balela Presenter: Marvin U. Herrera University of the Philippines Los Banos, Philippines Polyacrylonitrile-coated kapok fibers (PAN-KF) were used as sorbent material for methyl orange (MO) dye under dynamic conditions using a fixed bed set-up. The PAN molecules were coated on kapok fibers using a facile surfactant-assisted technique. In this technique, cetyltrimethylammonium bromide (CTAB) molecules were used as the surfactant and acrylonitrile as the precursor monomer. PAN-KF successfully absorbed MO under dynamic conditions. Long breakthrough and exhaustion times were achieved at lower initial concentration of methyl orange, higher bed height, and slower flow rate. Furthermore, PAN-KF sorbent in a fixed bed set-up has larger removal efficiency and exhaustion capacity compared to that of activated charcoal with the same mass and bed height.
MG1-076 10:45-11:00	Natural luminescent carbon nanoparticles extracted from coconut water Aly Aly, Mohsen Ghali, Ahmed Osman and Mostafa Elnimr Presenter: Aly Hesham Aly Egypt Japan University of Science and Technology (E-JUST), Egypt The synthesis methods of carbon nanoparticles (CNPs) are of utmost importance to the commercialization of CNPs as they need to have an efficient cost-to-gain ratio and be power-conservative. In this paper, we report on a facile method for extracting CNPs out of a renewable and green source of coconut water without the need for any time or energy consuming synthesis procedure.

	Namely, the CNPs were essentially extracted by filtration of coconut water using a dialysis bag to remove long-chain carbohydrates and bulk contaminants. The obtained CNPs were characterized using several techniques including transmission electron microscope TEM, X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), UV-Vis, and photoluminescence (PL) spectroscopy. It was found that the obtained CNPs have a lateral average size of 4.5 nm and interestingly show UV and blue light emissions when excited optically by deep UV light. The latter indicates the potential application of these CNPs in optoelectronics. XPS data shows a C/O ratio of 65%/28% which is an expected result for the surface bonds of a CNPs and is in agreement with the FTIR data which demonstrates a dominance of carbon and oxygen-based function groups. The CNPs also demonstrate a long lifetime of 5.3ns which is relatively longer that in literature.
MG1-132 11:00-11:15	PAN-PVP-CD-MOF Composite Beads for the Removal of Crystal Violet and Brilliant Blue G in Water Jem Valerie Perez and Edgar Clyde Lopez Presenter: Edgar Clyde R. Lopez University of the Philippines Diliman, Philippines Cyclodextrin metal-organic frameworks (CD-MOFs) have a high surface area and unique coordination chemistry that enable them to be used as a carrier material for various materials. However, it is unstable in water, limiting its application in aqueous solutions. Here, we report the application of CD-MOFs in treating cationic and anionic dyes in water for the first time by forming a composite with polyacrylonitrile (PAN) and polyvinylpyrrolidone (PVP) to form composite beads. The composition of the composite beads was optimized through a Box-Behnken design of experiments. The optimum composition of PAN = 5.91 wt.%, PVP = 1.89 wt.%, and CD-MOF = 2.68 wt.% yielded a CV and BB sorption capacities of 50.8109 $\pm$ 0.0634 mg/g and 28.5583 $\pm$ 0.1296 mg/g, respectively. The composite beads were characterized using SEM, EDX, and FTIR. We showed that CD-MOFs could be used as an adsorbent for wastewater treatment.
MG1-127 11:15-11:30	Removal of methylene blue in aqueous solution using nanosilica based sorbent from volcanic ash. Rhonalyn Maulion, Rejie Magnaye, Elisa Gutierrez, Anita Aquino, Rosenda Bronce and Eufronia Magundayao Presenter: Rhonalyn Maulion Batangas State University, Philippines In this study, a mesoporous nano-SiO2 from Taal volcanic ash was successfully synthesized via sol-gel precipitation method and used effectively as adsorbent of methylene blue in aqueous solution. The silica rich volcanic ash from Taal contains 43.5% SiO2 which is the precursor of nano-SiO2 and characterized using scanning electron microscope (SEM), energy dispersive X-ray (EDX), Fourier

	transform infrared spectroscopy (FTIR), X-ray fluorescence (XRD) and Brunauer, Emmett and Teller (BET). The synthesized nano-SiO2 have an average size of 45 nm, surface area of 181.66 m2/g, pore size of 16 – 25 nm with purity greater than 99.9%. Characteristics bands at 3410cm-1 attributed to -O-H- stretching of silanol groups, and a sharp peak at 1067cm−1 and 801 cm−1 indicating siloxane (-Si-O-Si-) functional groups. XRD analysis revealed an amorphous nature of nano-SiO2 with crystallite size of 2.96nm. A ~99.9 % maximum removal was reached at pH 8, adsorbate concentration of 25mg/L, adsorbent dose of 1.87 g/L at 22.89 minutes contact time and found to be reusable even after 5 cycles. Adsorption was best explained by Langmuir model having 65.5 mg/g maximum monolayer adsorption capacity. Kinetic studies showed a pseudo 2nd order with R2 of 99.9%.
MG1-130 11:30-11:45	The assessment of permeability of biological implant structure using DLP-manufactured TPMS lattice physical models Lucynda T. Lumba, Stanislav Chernyshikhin, Biltu Mahato, Sergey G. Abaimov and Igor Shishkovsky Presenter:Lucynda T. Lumba Skolkovo Institute of Science and Technology,Russia The purpose of the present study was to assess the permeability of a biological implant structure in the form of a gyroid lattice triply periodic minimal surface (TPMS) used to mimic the structure of the trabecular bone found in the human body. The approach allowed identifying the structure with optimal permeability via fluid flow through experimental testing of TPMS structures prepared using Digital Light Processing (DLP) 3D printing. Radial permeative flow was considered and found to be affected by porosity and viscosity. Experimentally derived permeability values were compared with numerical predictions, and disagreement assessed and discussed.