Conference Program

Tokyo, Japan | April 10-13, 2020

The 4th International Conference on Material Engineering and Manufacturing (ICMEM 2020)

2020 3rd International Conference on Materials Design and Applications (ICMDA 2020)

The 2nd International Conference on Biomacromolecules and Biomimetic Materials (ICBBM 2020)

Co-Sponsored By:

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Presentation Guideline:

Time Zone: GMT+9 (**Japan Local Time**)
Please note your local time based on the Japan Time.

◆ Equipment needed:

1. A computer with an internet connection (wired connection recommended)
2. USB plug-in headset with a microphone (recommended for optimal audio quality)
3. Webcam: built-in or USB plug-in

◆ Environment requirement

1. Quiet Location
2. Stable Internet Connection
3. Proper lighting

◆ Learn the zoom skills

1. The instructions about Zoom, please visit:
https://support.zoom.us/hc/en-us/articles/201362033-Getting-Started-on-Windows-and-Mac

2. To get the Zoom Video Tutorials, please go to:
http://www.icmem.org/zoom/guidelines.html

◆ Join the test session before the formal session

1. There will be a **test session** (**April 10**) before the **formal session** (**April 11 and 12**) to help you master how to use Zoom to make presentation and **make the formal sessions goes smoothly.**
2. Keynote and invited speakers' test time is **10** minutes per one.
3. Regular authors' test time is **5** minutes per one.

◆ Attention please:

The conference will be recorded, we will appreciate your proper behavior.

◆ Record videos notes

To effectively control the time and avoid some unexpected situations, we advise you to record your presentation in advance as a backup.

1. Keynote and invited speech: about **35** minutes for presentation and **5** minutes for Q&A; Regular oral presentation: about **13** minutes for presentation and **2** minutes for Q&A
2. Record a video introduction with your own image, speaking to the camera, introducing yourself: name, affiliation, brief description of scope of your work.
3. Then please switches to your slides and provides a voiceover describing images in each slide
4. Please send your recorded videos to Conference Secretary in advance.

◆ Emphasis

1. Test and formal presentation room (**April 10 - 12, 2020**)
   Meeting ID: 975-783-173

2. Q&A room (**April 10 - 13, 2020**)
   Meeting ID: 580-823-053

3. Keynote Speech & Session I+II Replay Room:
   Meeting ID: 975-783-173

   Session III+IV Replay Room:
   Meeting ID: 621-834-002

◆ How to access Online Meeting Room

1. Open Zoom app and create account firstly.
2. Sign in your account.
3. Copy the **Meeting ID** directly and then click  **Join** button.
4. Please **rename** your name with this format (**Paper ID + Name)** before entering the online meeting room.

Organizing Committee

Conference Chairs:

Prof. Takashige Omatsu, Chiba University, Japan
Prof. Xiaozhong Zhang, Tsinghua University, China

Program Chairs:

Prof. Hongqi Sun, Edith Cowan University, Australia
Prof. Zhigang Zhu, Shanghai Polytechnic University, China
Assoc. Prof. Cheng Chen, Shanghai Polytechnic University, China

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Dr. Siam Thongnak, Suranaree University of Technology, Thailand
Dr. Sakhob Khumkoa, Suranaree University of Technology, Thailand
Dr. Tanongsak Yingnakorn, Suranaree University of Technology, Thailand
Dr. Yu-Chih Tzeng, National Defense University, Taiwan

Speakers Introduction

Speaker I

Prof. Takashige Omatsu

from Chiba University, Japan

Topic Title: Structured light produces helical materials and beyond

Abstract:

We review light induced helical materials and beyond. Structured light fields with an orbital angular momentum (OAM) originated from their helical wavefronts enable us to twist the irradietd materials, including metal, silicon, polymer, and even liquid-phase resin, to form a myriad of nano/micro-scale helical structures. Such light induced helical structures should offer new advanced material sciences and technologies.

Biography:

Takashige Omatsu (B.S. (1983), Ph.D. (1992) from the University of Tokyo) is a professor of nano-science division of a faculty of engineering in Chiba University.His research intersts cover a variety of areas, such as nonlinear optics, solid-state and fiber lasers, singular optics, and super-resolution spectroscopy. Recent work has focused on chiral control of nano-structures by angular momentum of light. Such chiral nano-structures will potentially provide a new scientific aspect to metamaterials, plasmonics, and silicon photonics, and they might also enable us to develop nanoscale imaging systems with chiral selectivity.

He has already published >100 refereed journal articles, and he has performed >20 invited presentations of major international conferences, including CLEO, CLEO Pacific-Rim, CLEO Europe, LEOS, and ICALEO meetings. He has been appointed as an Associate Editor of Optics Express during 2006-2012. He is also on the editorial board of Applied Physics Express. He is currently working as a steering committee member of the conference on the laser and optoelectronics pacific-rim (CLEO Pacific-rim). Professor Omatsu is a Fellow of the Japan Society of Applied Physics, and a Senior Member of the Optical Society of America. He is also Visiting Professor, Xinjiang Normal University, China.

Speaker II

Prof. Stephen John Pennycook

from National University of Singapore, Singapore

Topic Title: Engineering Smart Materials via Atomic-resolution Microscopy and Spectroscopy

Abstract:

The development of smart catalysts, piezoelectrics, thermoelectrics, light emitting diodes and 2D materials and devices is increasingly important in addressing environmental and energy concerns. The powerful combination of aberration-corrected microscopy and theoretical calculations allows a direct correlation of atomic-scale structure and bonding to materials' properties, representing a new and efficient approach to materials' development. A number of illustrative examples will be presented.

Biography:

Stephen J. Pennycook is a Professor in the Materials Science and Engineering Dept., National University of Singapore, an Adjunct Professor in the University of Tennessee and Adjoint Professor in Vanderbilt University, USA. Previously, he was Corporate Fellow in the Materials Science and Technology Division of Oak Ridge National Laboratory and leader of the Scanning Transmission Electron Microscopy Group. He completed his PhD in physics at the Cavendish Laboratory, University of Cambridge in 1978. Pennycook is a Fellow of the American Physical Society, the American Association for the Advancement of Science, the Microscopy Society of America, the Institute of Physics and the Materials Research Society. He has received the Microbeam Analysis Society Heinrich Award, the Materials Research Society Medal, the Institute of Physics Thomas J. Young Medal and Award and the Materials Research Society Innovation in Characterization Award. He has 38 books and book chapters, over 400 publications in refereed journals and has given over 200 invited presentations on the development and application of atomic resolution Z-contrast microscopy and electron energy loss spectroscopy. His latest book is "Scanning Transmission Electron Microscopy."

Speaker III

Prof. Hongqi Sun

from Edith Cowan University, Australia

Topic Title: Carbon nitride based photocatalysts for energy and environmental applications

Abstract:

Photocatalysis has demonstrated tremendous progresses for solar energy utilisation and conversion. The photocatalyst materials play the crucial role in the way towards practical applications. Recently, as the alternative to metal-based semiconductors, an emerging carbon-based photocatalyst, namely graphitic carbon nitride (g-C_3N_4), has been intensively used for photocatalytic reactions. In this talk, an overview of recent research progresses on modification of pristine carbon nitride for environmental and energy applications is first provided in-detail. Discussion on the morphology, copolymerization, doping, hybridization and sensitization will be then made. At last, perspectives in future research and application opportunities are proposed.

Biography:

Dr. Sun became a Full Professor of Chemical Engineering at ECU in November 2017. Before he joined ECU in 2016 as an Associate Professor through the campaign of Vice-Chancellor's Professorial Research Fellowship, he had worked at Curtin University for over seven years, beginning with a Research Fellow position (2009) to Curtin Research Fellow (2013) and then to Senior Research Fellow (2015). He remains an Adjunct Professor of Curtin University. His research focuses on synthesis of nanostructured catalyst materials, such as shape-controlled metals or oxides, nanocarbons, arrays and quantum dots for solar energy utilization and environmental remediation. So far he has published over 160 refereed journal papers and received over 8200 citations and achieved an h-index of 55 (Data from Google Scholar in October 2018). He has also secured over three million dollars funding including three ARC discovery projects, four CRC projects and two fellowships. He serves as an Associate Editor of RSC Advances and Journal of Advanced Oxidation Technologies, assessor of ARC, committee member of international conferences, and referee of international journals.

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Conference Agenda

April 10, 2020	**Test Presentation**
April 11, 2020	**Formal Presentation**
April 12, 2020	**Formal Presentation**
April 13, 2020	**Replay Presentation**

April 10, 2020 - Test Presentation

Meeting ID: 975-783-173

10:00 ~ 10:30	Test Keynote Speech
10:30 ~ 10:40	Break
10:40 ~ 11:20	Test Session I - Metallic Material
11:30 ~ 12:10	Test Session II - Composite Material
14:00 ~ 14:35	Test Session III - Material Characterization
14:40 ~ 15:20	Test Session IV - Mechanical System
15:30 ~ 17:30	Q&A Time | Meeting ID: 580-823-053

April 11, 2020 - Formal Presentation

Meeting ID: 975-783-173

9:30 ~ 9:40	Opening Remarks **Prof. Takashige Omatsu | Chiba University, Japan**
9:40 ~ 10:20	Speech I **Prof. Stephen John Pennycook | National University of Singapore, Singapore** Topic: Engineering Smart Materials via Atomic-resolution Microscopy and Spectroscopy
10:20 ~ 10:30	Break
10:30 ~ 11:10	Speech II **Prof. Takashige Omatsu | Chiba University, Japan** Topic: Structured light produces helical materials and beyond
11:10 ~ 11:50	Speech III **Prof. Hongqi Sun | Edith Cowan University, Australia** Topic:
11:50 ~ 13:30	Break

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13:30 ~ 15:30	Formal Session I – Metallic Material
15:30 ~ 15:40	Break
15:40 ~ 17:40	Formal Session II – Composite Material

April 12, 2020 – Formal Presentation

Meeting ID: 975-783-173

10:00 ~ 11:45	Formal Session III – Material Characterization
11:45 ~ 13:00	Break
13:00 ~ 15:00	Formal Session IV – Mechanical System

April 13, 2020

Replay Presentation

10:30 ~ 12:30	Keynote Speech Replay | Meeting ID: 975-783-173
12:30 ~ 14:00	Break
14:00 ~ 18:00	Session I&II Replay | Meeting ID: 975-783-173
14:00 ~ 17:45	Session III&IV Replay | Meeting ID: 621-834-002

Japan Local Time | GMT +9

Overview

Meeting ID: 975-783-173

Speakers Session (Test & Formal)		
Session / **Speaker**	Test Session **(April 10, 2020)**	Formal Session **(April 11, 2020)**
Prof. Stephen John Pennycook	10:00 ~ 10:10	9:40 ~ 10:20
Prof. Takashige Omatsu	10:10 ~ 10:20	10:30 ~ 11:10
Prof. Hongqi Sun	10:20 ~ 10:30	11:10 ~ 11:50

Session I (Test & Formal)		
Session / **Author**	Test Session (**April 10, 2020**)	Formal Session (**April 11, 2020**)
MT20-330	10:40 ~ 10:45	13:30 ~ 13:45
MT20-322	10:45 ~ 10:50	13:45 ~ 14:00
MT20-357	10:50 ~ 10:55	14:00 ~ 14:15
MT20-312	10:55 ~ 11:00	14:15 ~ 14:30
MT20-318	11:00 ~ 11:05	14:30 ~ 14:45
MT20-361	11:05 ~ 11:10	14:45 ~ 15:00
MT20-325	11:15 ~ 11:15	15:00 ~ 15:15
MT20-324	11:15 ~ 11:20	15:15 ~ 15:30

Session II (Test & Formal)		
Session / **Author**	Test Session (**April 10, 2020**)	Formal Session (**April 11, 2020**)
MT20-333-A	11:30 ~ 11:35	15:40 ~ 15:55
MT20-305	11:35 ~ 11:40	15:55 ~ 16:10
MT20-353	11:40 ~ 11:45	16:10~ 16:25
MT20-232	11:45 ~ 11:50	16:25 ~ 16:40
MT20-341	11:50 ~ 11:55	16:40 ~ 16:55
MT20-354-A	11:55 ~ 12:00	16:55 ~ 17:10
MT20-367	12:00 ~ 12:05	17:10 ~ 17:25
MT20-505-A	12:05 ~ 12:10	17:25 ~ 17:40

Session III (Test & Formal)		
Session / **Author**	Test Session (**April 10, 2020**)	Formal Session (**April 12, 2020**)
MT20-216-A	14:00 ~ 14:05	10:00 ~ 10:15
MT20-317	14:5 ~ 14:10	10:15 ~ 10:30
MT20-345	14:10 ~ 14:15	10:30 ~ 10:45
MT20-504	14:15 ~ 14:20	10:45 ~ 11:00
MT20-355	14:20 ~ 14:25	11:00 ~ 10:15
MT20-328	14:25 ~ 14:30	11:15 ~ 11:30
MT20-211	14:30 ~ 14:35	11:30 ~ 11:45

Session IV (Test & Formal)		
Session / **Author**	Test Session (**April 10, 2020**)	Formal Session (**April 12, 2020**)
MT20-320	14:40 ~ 14:45	13:00 ~ 13:15
MT20-323	14:45 ~ 14:50	13:15~ 11:30
MT20-342	14:50 ~ 14:55	13:30 ~ 13:45
MT20-214-A	14:55 ~ 15:00	13:45 ~ 14:00
MT20-343	15:00 ~ 15:05	14:00 ~ 14:15
MT20-230	15:05 ~ 15:10	14:15 ~ 14:30
MT20-507	15:10 ~ 15:15	14:30 ~ 14:45
MT20-369-A	15:15 ~ 15:20	14:45 ~ 15:00

Note:

1. No matter what you join in the test or formal session, **please enter the online meeting room 10 minutes in advance.**
2. The online meeting room will open half an hour before the conference starts.
3. To show the respect to other authors, we strongly advise you to attend the whole session whether you are in test or formal session.

Session I - Metallic Material

April 11, 2020 | Time: 13:30 ~ 15:30

Meeting ID: 975-783-173	Host: Ms. Violet Xie

Session Chair: Prof. Takashige Omatsu, Chiba University, Japan

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MT20-330

Title: A Feasibility Study on Metallurgical Slag Classification by Microstructure Recognition

Jirapracha Thampiriyanon, Kitti Laungsakulthai, Piamsak Laokhen, Siam Thongnak and Sakhob Khumkoa

Suranaree University of Technology, Thailand

Abstract:

Property of metallurgical slag generated in smelting or refining process of ferrous production can be determined by its microstructure which depends on chemical composition and production process. This study proposes a deep learning method which is a subfield of artificial intelligence for autonomous slag classification by microstructure recognition. This present work focus on the implementation of a convolutional neural network (CNN) to classify four types of slags that the variance microstructure resulted from the difference of their formation condition. Both secondary electron (SE) and backscattered electron (BSE) image type captured by scanning electron microscope (SEM) are used as dataset. ResNet50, InceptionV3 and DenseNet201 network architectures are selected in this study to evaluate their classification performance. In addition, data augmentation manipulated by the software is randomly flipped both horizontally and vertically to avoid overfitting from a limited number of training images. The results showed that the best approach to classification accuracy is reached 98.89% by CNN. Therefore, it can be concluded that CNN is excellent potential method for autonomous slag microstructure classification systems.

MT20-322

Title: Recovery of Silver from Solar Panel Waste: An Experimental Study

Natcha Wongnaree, Woranittha Kritsarikun, Natthicha Ma-ud, Chatisa Kansomket, Tapany Patcharawit and Sakho Khumkoa
Suranaree University of Technology, Thailand

Abstract:

The aim of this study was to develop a recycling process to recover silver metal from solar panel waste. Experimental procedure consisted of mechanical/physical separation, leaching of silver from silicon wafer and precipitation to retrieve silver chloride (AgCl) precipitate. The precipitated AgCl was reduced to silver precipitate form which was subsequently heated up to produce silver metal. The leaching process was first conducted by using 4 M of nitric acid for 24 hrs. The silver-containing leached solution would then be added by sodium chloride solution to precipitate AgCl. The precipitate was filtrated out from the solution and was rinsed with water ready for further step. The rinsed precipitate was dissolved in water, then sucrose and sodium hydroxide were added to achieve precipitated silver. Finally, the precipitated silver was burned with acetylene gas to finally obtain silver metal. Base on the experiment the purity of silver metal of 99.98% can be achieved and by considering recycling of solar panel of 1,000 kg the recycling product of pure silver of 0.23 kg could be acquired.

MT20-357

Title: Effect of Temperature in Carbothermic Reduction of Indonesian Limonite Ore using Printed Circuit Boards as Reducing Agent

Reza Miftahul Ulum, ***Andy Kurnia Wicaksana*** and Faizinal Abidin
Universitas Indonesia, Indonesia

Abstract:

In recent years, there have been increases in the production of electronic waste, such as Printed Circuit Board (PCB), because of the rapid advancement of technology. PCBs are highly valuable, as they contain metals such as copper, silver, and gold. This research aims to investigate the feasibility of using PCB, discarded from laptops as the reducing agent for the carbothermic reduction process of Indonesian limonite ore and the effect of temperature on the carbothermic reduction process, specifically on the phase transformation and the differences in microstructure. Based on the TGA-DSC result, the mixture of limonite and PCB have three endothermic peaks at 90 °C, 290 °C, 450 °C and one exothermic peak at 910 °C, whereas the mixture of limonite and coal has the same trends but the exothermic peak occurs at 1070 °C. To investigate the effect of PCB powder on the reduction of limonite ore, a carbothermic reduction experiment was carried out through the mixing of 8.0 g of limonite ore with 2.0 g of PCB powder (20 wt.%), which was then further compacted. The experiment was carried out at temperature variations of 700 °C, 900 °C, 1100 °C for 1 hour in an inert atmosphere furnace. The products of the reduction process were magnetically separated and then characterized using SEM/EDS and XRD to evaluate the differences in microstructure. This research found that PCB powder is a feasible reducing agent for the reduction of limonite ore.

MT20-312

Title: Study on Microstructure Transformation of High Strength Hot Rolled Steel by Using Finite Element Simulation

Siam Thongnak, Tanongsak Yingnakorn, Loeslakkhana Sriklang and Sakhob Khumkoa
Suranaree University of Technology, Thailand

Abstract:

High-strength steels (AHSS) has widely application in automotive due to their high tensile strength and remarkable ductility. These good mechanical performances are strongly influenced by the processing and final microstructure. This paper performed Deformation Dilatometer and finite element simulation to study the effect of hot rolling parameters such as strain, cooling rate, and holding time at constant temperature on the microstructure formation of Nb-V low carbon microalloyed steel grade. It found that increasing deformation degree increased the volume fraction of ferrite, both of deformation dilatometer and finite element simulation give a similar trend of effects of hot rolling parameters on evolution of volume fraction of ferrite. These results give an insight for industrial application.

MT20-318

Title: Study on Recovery of Rare Earth Elements from NdFeB Scrap by Using Selective Leaching

Tanongsak Yingnakorn, Piamsak Laokhen, Loeslakkhana Sriklang, Tapany Patcharawit and Sakhob Khumkoa
Suranaree University of Technology, Thailand

Abstract:

High power neodymium magnets have been used extensively, such as components of hard disk drives, electric vehicles, and maglev trains. This type of magnet contains of high concentration of rare earth elements. After the device is out of service, the magnet will be removed and the rare earth element contained in the magnet will be extracted in order to reuse for any purposes. Recently, the study on extraction of rare earth elements (REE) from neodymium magnets is increased. However, there was only few research regarding to the extraction of rare earth metals by using a water leaching method. In this study, rare-earth elements were extracted from neodymium magnet scrap by using selective leaching technique. Initially, magnets were leached with 2 M of sulfuric acid for 24 hrs. Then, the leached solution was heated at 110ºC in order to remove water and the green powder was remained. The green powder was further roasted in a muffle furnace at various temperatures from 750°C to 900°C for 2 hrs. and subsequently leached by water. Finally, the iron oxide residue was separated from rare earth element solution by filtration. Based on this experiment, it was found that the purity of the rare earth metals can be achieved up to 99.4%.

MT20-361
Title: On Material Removal Mechanism in High Speed Single Grit Scratch Grinding of Cryo-treated Al2024-T351 Aluminium Alloy
Sweety Satpathy and Amitava Ghosh
Indian Institute of Technology, Madras

Abstract:

Feasibility of utilizing cryogenic technology to improve the shearability of Al2024-T351 alloy is experimentally investigated by carrying out a single grit scratch-grinding test. A single grit brazed diamond grinding tool is developed for the study. Al2024-T351 work specimens are treated with liquid nitrogen for 6 hours before the scratch test. Although there was no significant change in the tensile strength of the material, the surface experiences change in the microhardness. It helps in arresting the side flow and ploughing of the material during high speed scratch grinding. The scratched grooves on cryo-treated samples, compare to those of untreated specimens, shows signs of cleaner shear-cuts, superior finish and produces less grinding force during grinding.

MT20-325
Title: Study on Leaching of Molybdenum from a Spent HDS Catalyst
Chatisa Kansomket, Thanapon Chandakhiaw, Natthicha Ma-ud, Tanongsak Yingnakorn, Tapany Patcharawit and Sakhob Khumkoa
Suranaree University of Technology, Thailand

Abstract:

The aim of this study is to investigate the extraction of molybdenum from the spent HDS catalyst. The experiment was performed by using the pyro-hydrometallurgical process; calcination and leaching. The spent catalyst was calcined at different temperatures in order to investigate the effect of calcination temperature on the recovery of molybdenum in the subsequent process. Leaching of the calcined samples was subsequently performed by using the different concentrations of leaching reagent. The leaching was conducted by varying the concentration of NaCO3 of 20 g/L, 30 g/L and 40 g/L with a fixed leaching temperature of 90oC, a S/L ratio (weight of calcined sample/volume of leaching reagent) of 100 g/L and leaching time of 1 hrs. under the stirring condition at a speed of 250 rpm. It was found that carbon and sulfur contained in the spent HDS catalyst could be reduced by the calcination process and resulting in enhanced extraction efficiency of molybdenum. The extraction efficiency of molybdenum increased with increasing concentration of leaching reagent. At a certain concentration of leaching reagent, the extraction efficiency of the sample calcined at lower temperatures was higher than the sample which was subjected to calcination at a higher temperature.

MT20-324

Title: Smelting Reduction of Spent Catalyst Containing Nickel: A Preliminary Study

Kitti Laungsakulthai, Thanapon Chandakhiaw, Natcha Wongnaree, Jirapracha Thampiriyanon, Woranittha Kritsarikun and Sakhob Khumkoa
Suranaree University of Technology, Thailand

Abstract:

The aim of this research was to study the recycling process and the feasibility to smelt the spent nickel catalyst for the production of nickel alloy or ferronickel. The smelting process was carried out in a laboratory induction furnace. The effects of SiO_2/CaO for slag forming on metal recovery and smelting time were investigated. Petroleum coke was used as reductant. Mill scale was used as an iron resource for ferro-alloy production, while CaO was used as slag forming agent. The raw materials were mixed together and put into a graphite crucible, which was then placed in the induction furnace. After the melt was completed, the melt was poured into a mold to solidify. The chemical composition of the product was analyzed by XRF and XRD. It was found that the smelting time was decreased with increasing SiO_2/CaO from 1.0 to 2.3. For nickel alloy production, increasing of SiO_2/CaO increased the weight of metal product. For the ferronickel production, however, the weight of metal product was found not to vary with different ratio of SiO_2/CaO.

Session II - Composite Material

April 11, 2020 | Time: 15:40 ~ 17:40

Meeting ID: 975-783-173	Host: Ms. Jane Li

Session Chair: Prof. Andreas Pitsillides, University of Cyprus, Cyprus

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MT20-333-A

Title: Laser Additive Manufactured High-performance Fe-based Composites with Unique Strengthening Structure

Hongyu Chen and Dongdong Gu

Nanjing University Of Aeronautics And Astronautics, China

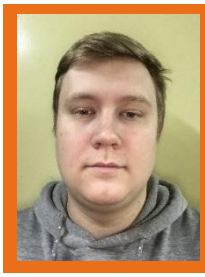
Abstract:

Steel matrix composites (SMCs), reinforced by ceramic particles, have received a consistent attention in recent years. Using conventional methods to prepare SMCs is generally challenging as well as tedious, and the mechanical properties of conventionally fabricated SMCs are limited. In this study, we successfully fabricated high-performance SMCs by laser additive manufacturing (LAM) of a composite powder consisting of Fe-based powder and submicron-sized WC particles. The effect of laser energy density on the phase formation, microstructural evolution, overall density and resulting mechanical properties of LAM-fabricated composites is investigated. The present results show that a novel Fe_2W_4C carbidic network precipitates in the solidified microstructure entailing segregations along the boundaries of cellular sub-grains. The presence of this carbidic network hampers the growth of sub-grains even at elevated temperatures and, hence, stabilizes the grain size though prepared at a broad range of different energy densities. The exact distribution of the Fe_2W_4C carbides depends on the employed laser energy densities, as for instance they are more uniformly distributed at higher energy input. The density of LAM-processed composites reaches the maximum value of 99.4% at 150 J/mm^3. In this parameter set, high microhardness of ~753 HV, compression strength of ~3350 MPa and fracture strain of ~24.4% are obtained. The enhanced mechanical properties are ascribed to less metallurgical defects, higher volume fraction of the martensitic phase and increasing pile-up dislocations resulting from the pinning effect by Fe_2W_4C carbide.

MT20-305
Title: Monitoring of the High-technology Nailing of CFRTP Material under Ultrasonic Vibration by Acoustic Emission Method
Yoshiaki Akematsu, Hiromitsu Gotho, Takayuki Tani, Hideaki Murayama, Tsuyoshi Matsuo and Kazuro Kageyama
Tsukuba University of Technology, Japan

Abstract:

In this study, the potential to monitor the high-technology nailing of carbon fiber reinforced thermoplastic material (CFRTP) under ultrasonic vibration was investigated by acoustic emission (AE) method. AE signals were detected by a piezoelectric AE sensor during high-technology nailing under ultrasonic vibration. This paper describes some experimental results on AE signal characteristics and observation of the high-technology nailing. In order to investigate the effects of machining condition, we focused on RMS voltage, which is dependent on the energy parameter of the AE signal. It was found that the AE method is a useful method of monitoring high-technology nailing.



MT20-353
Title: Features of Molding and Structure of Composite Materials Based on TiB/Ti, Obtained by Free SHS Compression Method
Andrey Chizhikov, Alexander Konstantinov, Pavel Bazhin and Alexander Stolin
Institute of Structural Macrokinetics and Materials Science Russian Academy of Sciences, Russia

Abstract:

The work presents the thermodynamic calculations of the adiabatic combustion temperature and the fraction of the liquid titanium phase during the chemical reaction of the initial titanium and boron powders with the initial titanium content from 5 to 80 wt. % during the synthesis of materials based on TiB-Ti. It is shown that with an increase in the preheating temperature of the initial samples to 500 °C, the combustion temperature of the selected composition increases from 3200 to 3600 K, and the fraction of the liquid phase increases from 40 to 80 %. The peculiarity of molding composite materials based on TiB-Ti under conditions combining self-propagating high-temperature synthesis (SHS) and high-temperature shear deformation is studied. These conditions are realized in the method of free SHS compression, which allows synthesizing, molding and obtaining compact material in tens of seconds without using special molds. It was found that the maximum degree of deformation of the synthesized material corresponds to 20-40 wt. % free titanium. For the selected compositions, compact composite materials were obtained by free SHS compression method, the structural features were studied, and the density and porosity of the central and regional parts of the samples were measured.

MT20-232
Title: The Influence of the Synthesis Method on the Formation of Phase Composition and Catalytic Centers $Gd_2Zr_2O_7$
Ekaterina Borisovna Markova, *Alexander Genrihovich Cherednichenko and V.V. Kurilkin, J.M. Serov*
RUDN University, Russia

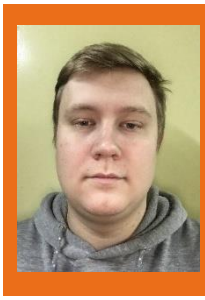
Abstract:

The influence of the type of crystal structure of complex gadolinium oxides on their catalytic activity was studied using a wide range of physicochemical methods. It was shown that the synthesized nanocrystalline powders $Gd_2Zr_2O_7$ form highly symmetric face-centered cubic crystal structures. In the course of catalytic experiments, it was found that the formation of a cubic structure increases the degree of conversion of propane and the shift of cracking temperatures to a lower area. The formation of various defects contributes to the course of the dehydrogenation or degradation reaction due to the different number of catalytic centers.

MT20-341
Title: Graphene Hypersurface for Manipulation of THz Waves
Sasmita Dash, Christos Liaskos, Ian F. Akyildiz and ***Andreas Pitsillides***
University of Cyprus, Cyprus

Abstract:

In this work, we investigated graphene hypersurface (HSF) for the manipulation of THz waves. The graphene HSF structure is consists of a periodic array of graphene unit cells deposited on silicon substrate and terminated by a metallic ground plane. The performance of the proposed HSF is numerically analyzed. Electromagnetic parameters of HSF such as permeability, permittivity, and impedance are studied. The proposed graphene HSF has active control over absorption, reflection, and transmission of THz waves. The graphene HSF provides perfect absorption, zero reflection and zero transmission at resonance. Moreover, the graphene HSF structure has the advantage of anomalous reflection and frequency reconfiguration. Incident waves can be reflected in the desired direction, depending on the phase gradient of the HSF and the perfect absorption is maintained at all reconfigurable frequencies upon reconfiguration. The results reveal the effectiveness of the graphene HSF for the manipulation of THz waves.



MT20-354-A

Title: The Studying TiB-40Ti Layered Composite Materials Obtained by Unconfined SHS Compaction

Alexander Konstantinov, Pavel Bazhin, Alexander Stolin, Andrey Chizhikov, Arina Prokopets and Elena Kostitsyna

Institute of Structural Macrokinetics and Materials Science Russian Academy of Sciences, Russia

Abstract:

Currently, the problem of creating and introducing new materials with improved physical and mechanical characteristics is relevant. These materials include layered composite materials (SCM), consisting of alternating layers of metal and intermetallic or ceramic. The high properties of SCM are due to a combination of increased values of hardness and stiffness of the intermetallic or ceramic phase, which alternates with high-strength, viscous and plastic layers of the metal alloy. This makes the use of such materials promising in aerospace engineering. In this article, we propose using the free SHS compression method to obtain SCMs based on the TiB-Ti system. This method combines the synthesis and high-temperature deformation of combustion products in one technological stage, which takes several seconds. The choice of the phase of titanium monoboride TiB is associated with a high modulus of elasticity, high strength, its thermodynamic stability, temperature coefficient of linear expansion similar in value to titanium (in contrast to, for example, SiC, Al_2O_3, and TiB_2), and at the same time, high adhesive strength of the boundaries section in SCM.

Compact plates with a size of 50x100x10 mm are obtained. The plates consist of alternating layers of TiB-40% Ti 3 mm thick and α-Ti layers 1 mm thick. The influence of process parameters on the structure, phase composition, and physicomechanical properties of the obtained SCMs were studied. The microstructure of TiB-40% Ti layers is represented by characteristic whiskers of titanium monoboride with a length of 1–2 to 20–30 μm and a thickness of up to 2 μm in the titanium matrix. It is shown that the obtained material has heat resistance at temperatures up to 1100 ° C.

MT20-367

Title: Impact of Graphene Thickness on EM Modeling of Antenna

Sasmita Dash, Christos Liaskos, Ian F. Akyildiz and ***Andreas Pitsillides***

University of Cyprus, Cyprus

Abstract:

This paper presents illustrative electromagnetic modelling and simulation of graphene antenna using a two-dimensional graphene sheet of zero thickness and a three-dimensional graphene slab of finite thickness. The properties of the antenna are analyzed in terms of the S11 parameter, input impedance, VSWR, radiation pattern, and frequency reconfiguration using the full-wave electromagnetic simulator. Furthermore, this work numerically studies the modelling of graphene antenna using a three-dimensional graphene thin slab and the impact of graphene slab thickness on the performance of graphene antenna.

MT20-505-A

Title: Tougher Ceramics: Bio-inspired Designs Applied on the Nanoscale

Koen Evers, Simone Falco and Richard I.Todd and Nicole Grobert
University of Oxford, UK

Abstract:

Technical ceramics are everywhere in our lives due to their high strength, hardness and chemical and wear resistance - unmatched by any other type of material available. There is one main problem that needs to be solved for more widespread application; their brittleness. Resistance to crack propagation or 'toughness' is almost non-existent. By studying and learning from natural materials we can apply microstructural architectures that have been created through millions of years of evolution. A main source of inspiration herein is nacre, the material found in abalone seashells. This natural material has an impressive combination of both strength and toughness.

We explore different methods to create biomimetic nacre-like building blocks and to self-assemble these building blocks into an aligned, nacre-like microstructure. Specifically, metallic oxide nanoparticles and carbon nanomaterials such as carbon nanotubes and fibers are used together with alumina micro-platelets to generate more sophisticated building blocks than those that are currently used in nature. We found that by using nanomaterial-functionalised building blocks in a biomimetic approach, we can provide toughness to ceramics, and see a radically different mechanical response (from brittle fracture to a graceful nacre-like failure), while at the same time being able to tailor conductive properties.

Session III - Material Characterization

April 12, 2020 | Time: 10:00 ~ 11:45

Meeting ID: 975-783-173	Host: Ms. Violet Xie

Session Chair: Assoc. Prof. Jia-Yi Yeh, Chung Hwa University of Medical Technology, Taiwan

Note: The online meeting room will open half an hour before the conference starts. Please join in the room **10 minutes** in advance. To show the respect to other authors, we strongly advise you to attend the whole session. The scheduled time for each presentation is for reference only, which might be changed due to unexpected situation. Please keep online during this session.

MT20-216-A
Title: Telos: Practical Wisdom (the useful and the beautiful)
Paolo Grazioli
MSU Denver , USA

Abstract:

Telos: Practical wisdom (the useful and the beautiful) 'We all have our philosophies, whether or not we are aware of this fact, and our philosophies are not worth very much. But the impact of our phi-losophies upon our actions and our lives is often devastating. This makes it necessary to try to im-prove our philosophies by criticism. This is the only apology for the continued existence of philosophy which I am able to offer' (Popper, "The Philosophy Of Karl Popper"). What are the relations between philosophy of design and philosophy at large? Philosophy of design can draw on insights from other fields of philosophy, like ancient Greek and Chinese philosophy. Can these ancient phi-losophies also offer a new insight to a more general philosophy of design? Moreover, can results from the philosophy of design be put to use in contemporary design practice, by leading us towards better artefacts, better design methods and, especially, better ethics for the creation of a more ethical society?

MT20-317
Title: Vibration and Wave Propagation Characteristic Analysis of Periodic Auxetic Star-shaped Structure System
Jia-Yi Yeh
Chung Hwa University of Medical Technology, Taiwan

Abstract:

In this paper, vibration and wave propagation characteristics of auxetic metamaterial of the star-shaped structure system are studied. The plane wave expansion method is adopted to investigate and calculate the band structures of the auxetic star-shaped structure system. Besides, the frequency ranges of the complete bandgaps are also obtained and discussed. Then, the *COMSOL*® finite element software is

utilized to solve wave propagation characteristics within the periodic auxetic star-shaped honeycomb structures. After that, the auxetic star-shaped structure devices made by 3D printed machine are used to measure the experimental results and also compared with numerical results. It can be seen that good agreements can be found in the discussions.

MT20-345
Title: Experimental and Numerical Investigation of Cutting Characteristics of PA6/PE Nylon Film Subjected to Wedge Indentation Process
Hanh Cong Nguyen and Shigeru Nagasawa
Nagaoka University of Technology, Japan

Abstract:

In this research work, we aim to evaluate the cutting resistance and deformation of a laminated nylon film subjected to a 42° wedged indentation. In order to reveal the effect of cutting parameters on the cutting features, the indentation experiment of 0.16 mm thickness of Polyethylene nylon film (PE-PA6) was conducted; the cutting line force was gotten using a recording unit; the bent-up angle and sheared profile of the worksheet were observed using a high-speed camera. From the experiment results, it was found that tip thickness was an important factor affected to the bent-up angle and quality of cutting profile of the nylon film. Also, the effect of cutting direction (PA6-PE and PE-PA6) of the nylon film was experimentally and numerically investigated.

MT20-504
Title: Preparation and Application of a Carboxymethylcellulose-based Citric Acid-crosslinked Coated Fertilizer System
Vince St. Mesias**,** ***Anne Bernadette Agu*****,** Precious Japheth Benablo, David Penaloza Jr.
De La Salle University – Manila, Philippines

Abstract:

A carboxymethylcellulose-based encapsulant system for the controlled release of nitrogen-phosphorus-potassium (NPK) fertilizer was synthesized using alginate as a stabilizer, and citric acid as a crosslinking agent. Fourier-transform infrared (FT-IR) spectroscopy, particle size analysis, zeta potential measurement, and scanning electron microscopy showed successful crosslinking, sufficient particle size and colloidal stability, as well as the topography of the formed particles. Fluorescence spectroscopy confirmed successful encapsulation of a model system, 8- anilino-1-napthalenesulfonic acid. Release behavior studies under various pH conditions showed that CMC/Alg NPK conformed to the standards of controlled release fertilizer with a maximum release rate of 50% over the span of 30 days.

has anti-hyperglycemic and anti-diabetic effects of FBS and MDA in male albino rats Wistar strain.

MT20-355
Title: Machining and Characterization of Double-Helical Grooves on Cylindrical Copper Parts by Wire Electric Discharge Turning
Jacob Serah Krupa and G L Samuel
Indian Institute of Technology Madras, India

Abstract:

In the work, the design and development of a novel Wire-EDM setup with double-wire guide discs is presented. It facilitates sparks to be generated between the workpiece and wire at two locations separated by the helical pitch distance. This sparking causes two helical grooves to be generated simultaneously on the surface of the workpiece when it is given suitable rotational speed and table feed. In this work, machining is carried out on rods of 1.5 mm diameter. Helical groves with helix angles ranging from 35 to 50^0 were generated and characterized. This method of machining the double helical grooves with a single pass reduces the machining time and eliminates the complexities involved in machining one groove at a time. It was observed that the proposed method is suitable for machining double helical grooves with helix angles in the range of 40 - 50°. The parts produced by the mentioned method can be used as EDM tools for generation of high aspect ratio holes in turbine blades and injection nozzles.

MT20-328
Title: Numerical Investigation on Key Process Parameters Affecting Blanking of Steel Sheet by Using Finite Element Method
M. Sahli, ***X. Roizard***, G. Colas, M. Assoul, PH Cornuault
Femto-ST Institute, France

Abstract:

The cutting surface obtained through the blanking process is often characterized by localized plastic deformations followed by crack propagation and ductile failure. The resulting blanked edge is essentially characterized by known areas such as shear zone, fracture zone and also sometimes burr. Their formation depends essentially on various process parameters and cutting material such as punch/die set, punch speed and temperature. The present study was carried out in order to investigate the possibilities for improving the quality of the cut-surface of high-alloy thick sheet steel. It was focused on modeling and analyzing blanking process of steel sheet using finite element method (FEM). The numerical results of the validation simulations were in agreement with the experimental results, thus validating the model parameters used. The model was developed in order to study the effects of process parameters on the blanking of mechanical steel parts, with particular attention to the study of punch-die gap influence.

MT20-211

Title: Hydrogen Adsorption Phenomena Simulation of ZSM-5 Zeolite using Molecular Dynamics Method

Jaka Fajar Fatriansyah and **Muhammad Ihsan Widyantoro**
University of Indonesia, Indonesia

Abstract:

Hydrogen energy has great potential to become one of the clean energies of the future. The current use of hydrogen gas as an energy source still has problems, namely in the distribution and storage system. One solution to overcome these problems is to use the adsorption method. Zeolite material is considered to be a good material to be used as a storage medium for hydrogen gas. Experimental research generally still requires a fairly high cost. Therefore, we need another method that can support it. In this research, the author used the Molecular Dynamics Simulation method. The variation of temperature used in this simulation is 77, 100, 150, 195, 273, and 293 K with a variation of pressure at each temperature is 1, 2, 4, 6, 8, and 10 bar. Our simulation results are then compared with the results of experimental research conducted by other researchers. At low pressure and high temperature, the results of our simulation are close to the results of experimental research. But at high pressure and low temperature, the results of our simulation are significantly different from the results of experimental research.

Session IV - Mechanical System

April 12, 2020 | Time: 13:00 ~ 15:00

Meeting ID: 975-783-173	Host: Ms. Elva Zhang

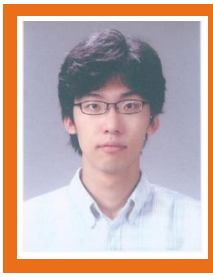
Session Chair: Prof. Hongqi Sun, Edith Cowan University, Australia

Note: The online meeting room will open half an hour before the conference starts. Please join in the room **10 minutes** in advance. To show the respect to other authors, we strongly advise you to attend the whole session. The scheduled time for each presentation is for reference only, which might be changed due to unexpected situation. Please keep online during this session.

MT20-320
Title: Sample Preprocessing Platform Based on Dissolution Method and Its Control System Design
Liangen Yang, Jingjing Ran, Yamei Luo, Tao He and Bin Wang
Hubei University of Technology, China

Abstract:

At present, the sample analysis and detection process in many field such as food and medicine is spent most of the time on the sample preprocessing step.In order to improve the detection efficiency and reduce the preprocessing error, a sample preprocessingt platform based on the dissolution method was designed, and its automation and control system were analyzed in detail. The platform automatically prepares solutions, handles batch samples, and ultrasonically extracts mixed solvents. The human-computer interaction interface and software system are designed based on PC and PLC for distributed control of valves, syringe pumps and three-dimensional motion mechanisms. The platform has high degree of automation and wide range of application , and solves the shortcomings of labor force, low efficiency and wide error source brought by manual preparation of solution.



MT20-323
Title: An Efficient Battery Charging Control Method for Motor Drive
Jung-Hyo Lee
Kunsan National University, Korea

Abstract:

This paper proposes an efficient battery charging control method for a motor drive. To sustain a robust and constant input voltage into the motor drive, a DC/DC converter is installed between the battery and the motor drive. This DC/DC converter is generally controlled by a constant voltage reference. However, because of this control method, the bidirectional battery current varies with the motor drive's load and speed, potentially deteriorating the efficiency of battery charging. In this paper, an improved battery charging control method that ensures a constant battery current is described. This proposed method is then

verified using a simulation of an electric vehicular application.

MT20-342
Title: A Critical Analysis of Medical Robotic Assistive Systems for early diagnosis of common ailments in South Africa
Obakeng Sehume Sehume and **Elisha Markus**
Central University of Technology, South Africa

Abstract:

Studies has shown that medical diagnosis of patients in most developing countries and especially in rural areas are adversely affected by lack of proper healthcare structures, poor patient to doctor ratio and sub-standard educational systems. More so, these services are not accessible due non-affordability and poor human resource allocation in public facilities. In an attempt to bridge this gap, medical Robotic assistive systems were recently introduced to enhance general healthcare access and to carry out early diagnosis of common ailments. The rapid expansion of wireless communication networks has enabled these developments. Such intelligence systems consist of wireless monitoring systems, sensor networks, medical devices, wireless communication, middleware software and software applications that help advance improvements in healthcare. This paper attempts to review the use of Medical Robotic assistive systems for early diagnosis of common ailments. Furthermore, the literature review exposes the gap in early diagnosis and some part of opportunity that have not been explored for early diagnosis of common ailments in rural areas. The study concludes that robotic systems will in fact be an important part of future interventions, but more research and clinical trials are needed.

MT20-214-A
Title: Design and Development of Inclined Plane with Triangle Degree System Control
Sirapob – Theppitak, Kanokkarn – Karnchanarat and ***JIttawisut - Wimuttipanya***
BSR University Bangkok Thailand ,Thailand

Abstract:

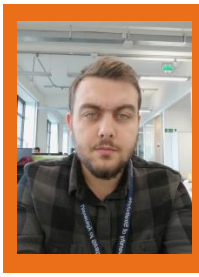
Design and development of inclined plane with triangle degree system control. The construction as simulation model using from metal steel size at 40 cm. X 50.5 cm. with a surface friction f=0.462 N and aduino 1.6.9 board control, 2 censer system controls, digital numeric board control witch that a triangle degree system control between 0.01°-90° degree with the object calculation of motion of objects on inclined plane in physics most will use an angle of 〖tan〗^(-1) θ of 30 37 45 60 75 degrees for convenience. The key button consist of 4 types 1) auto 2) manual 3) start and 4) stop for easy to used with physic formula a=gsinθ, s=ut+ at^2 that all variables controlled by digital board system. The result of achievement that post-test higher than pre-test score witch significant level at .05. In studying physics about the movement of objects on an inclined surface, students can adjust the angle of the digital system as needed. And able to find the answer to the acceleration of the object precisely Which is a simulation model that can create a learning experience in real-life situations and the application of understanding and

efficiency with learning in physics have imagination in creating jobs and applying knowledge and understanding to career innovation especially in agriculture tools, livestock, energy saving which is learning to build sustainable caring for the environment, ecology, and creating a happy learning society with digital science and technology.

MT20-343
Title: A SURVEY OF FORMATION CONTROL FOR MULTIPLE MOBILE ROBOTIC SYSTEMS
Lintle Tsiu and ***Elisha Markus***
Central University of Technology, South Africa

Abstract:

Multiple mobile robotic systems have been applied in many scenarios. This is because they have obvious advantages compared to single mobile robotic systems. However, their control could be challenging and is still an open problem in robotic research. This paper presents a survey of the current state of affairs on formation control of multiple mobile robotic systems. The main contribution of this paper is to comprehensively analyse different cooperative multiple mobile robotic control techniques used in various literature. Different techniques were analysed, their strengths and weaknesses identified. However, differential flatness approach of cooperative multiple mobile robots control has not gained much popularity; thus a gap of future work was determined.



MT20-230
Title: Effect of the Internal Pressure and External Loads on Nozzles in Cylindrical Vessels
Murat Bozkurt, David Nash and Asraf Uzzaman
University of Strathclyde, United Kingdom

Abstract:

Understanding the potential for supporting the maximum loading conditions in the system is a key feature in the design and analysis of pressure vessel applications.This is especially important for thin-walled pressure vessels, when stresses even reaching the initial material yield point could lead to very dangerous situations. Pressure vessels may be subjected to stresses arising from a variety of loading conditions including internal pressure and multiple external loading from attached piping systems. Once the yield point has been exceeded, the structure can accommodate more loading until the plastic zone becomes excessive leading to plastic collapse. This can be challenging to establish especially when external loads act in tandem with internal pressure. Therefore, this paper develops a finite element method for the limit load analysis of a single-nozzle cylindrical pressure vessel under internal pressure and external loading in a variety of combinations. Thereafter, a parametric study is presented covering various loading conditions, both singly and in combination. Finally, a comparison is made shown the interaction effects of the effects on the limit load for changes in vessel geometry and appropriate conclusions drawn.

MT20-507
Title: The Effect of Herbal Infusion on Fasting Blood Glucose (FBS) and Malondyaldehyde (MDA) Levels in Diabetic Rats
***Apriliani Ismi Fauziah*, Lintang Dian Saraswati, Ari Udiyono and Beti Safitri**
Diponegoro University, Indonesia

Abstract:

Aloe vera, ginger, and sappan wood have recently gained attention as a potent antioxidant. This study was undertaken to analyze the possible effects of oral administration of herbal infusion (the combination of *Aloe vera*, ginger, and sapang wood) on fasting blood glucose (FBS) and malondialdehyde (MDA) levels in diabetic rats. Forty male albino rats (150-250 gm) were divided into five groups (n=8 in each group): alloxan-induced diabetic (negative control group/K-), acarbose treated (positive control group/K+), diabetic rats treated with herbal infusion dose 6.75 mg/150 gmbw (P1), diabetic rats treated with herbal infusion dose 13.5 mg/150 gmbw (P2), and diabetic rats treated with herbal infusion dose 20.25 mg/150 gmbw (P3). Male albino rats induced with a dose of alloxan 120 mg/kgbw and also 5% glucose after 6 hours of alloxan induction. FBS and MDA levels of each rat were measured before induction of alloxan was performed as a control sample. After seven days and 14 days of herbal infusion administration, FBS parameters was investigated with a glucometer. In the last week, the concentration of MDA in serum blood was determined using a UV-VIS spectrophotometer with a wavelength of 545 nm. Diabetic rats exhibited a significant decrease in FBS and MDA. Administration of herbal infusion was reduced FBS significantly between groups (ANOVA, Bonferroni, $p<0.05$). The concentration of MDA in serum blood was decreased significantly on K-, K+, P1, P2, P3 compared to the control group (ANOVA, LSD, $P<0.05$). It could be postulated herbal infusion

MT20-369-A
Title: A Heart-on-a-chip Platform for Continual in Situ Stimulation and Monitoring of Functional Human Cardiac Tissues
Feng Zhang and Ping Ning Huang
Southeast University, China

Abstract:

Harnessing biomaterials for in vitro tissue construction has long been a research focus because of its powerful potentials in tissue engineering and pharmaceutical industry. Myocardium is a critical cardiac tissue with complex multiple muscular layers. Considering the specific characters of native cardiac tissues, it is necessary to design a biocompatible and biomimetic platform for cardiomyocyte culture and myocardium formation with sustained physiological function. In this study, we developed gelatin-based hydrogels chemically cross-linked by genipin, a biocompatible cross-linker, as cell culture scaffolds, which are favorable for the maturation of cultured neonatal rat ventricular cardiomyocytes, including rapid development of cell size, actin cytoskeleton, gap junction, and calcium transient. Combining the advantageous properties of hydrogels with external electrical stimulation modulated the beating behavior and induced remarkable enhancement of maturation of cardiomyocytes. Here, we found that electrical

stimulation promoted the organization of sarcomeres, establishment of gap junctions, calcium handling properties and propagation of pacing signals, thereby increasing beating velocity of cardiomyocytes and responsiveness to external pacing, as illustrated by immunofluorescent staining, calcium transients and the gene expression test. Finally, we prepared a heart-on-a-chip platform, which allows continuous electrical stimulation and monitoring of the cardiac tissues. This platform integrates stimulation and acquisition electrodes that was successfully used to culture beating human iPSCs derived cardiomyocytes over months, and generated mature and highly functional engineered cardiac tissues by directed electrical conditioning. We demonstrate the utility of the acquisition electrodes by in situ real-time recording electrophysiological signal of cardiac tissues. We also performed drug testing with calcium transient and demonstrated different drug sensitivities of stimulated and nonstimulated cardiomyocytes. Overall, the platform was confirmed to noninvasive functional monitoring and recording of long-term tissue function in real-time. We believe that the platform technology described in this paper has a potential to be used for early safety evaluation in drug development and drug efficiency testing for personalized therapy.

Poster Presentation

Please check the details via this link: *http://www.icmem.org/poster.html*

MT20-213
Title: Eccentric Interaction between Strong and Weak Axes in the Design of Asymmetric Angle Steel Strength
Wei-Ting Hsu ,**Shu-Ti Chung** ,Rou-Yin Liu
Chaoyang University of Technology , Taiwan

Abstract:

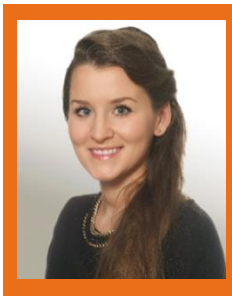
Steel structural members use many types of material sections and a wide range of sizes. Among them, Angle steel is more economical than I-type due to the use of materials, and is usually used for beam web support and diagonal support. Therefore, this study will analyze the eccentric axis strength change of L-shaped angle steel under the action of biaxial bending moment. The angle steel is divided into equilateral angle steel and unequal angle steel, and the calculation of unequal angle steel is the most complicated. Due to the asymmetry of the axial force, when the angle steel bears an axial force, it will cause eccentric load, which makes it the bending moment caused by the angle steel will change the structure. Therefore, in this study, an unequal-sided angle steel with a length of 10 ft. L8 × 4 × 7/16 was selected as the research object, and the eccentric strength changes of the strong and weak axial forces of the angle steel were analyzed.

MT20-307
Title: Development of Amoxicillin-loaded Modified Polycaprolactone Microparticles in Medical Application
Chalita Metheeparakornchai, Narumol Kreua-ongarjnukool, Saowapa Thumsing Niyomthai, Prasit Pavasant and Chalida Nakalekha Limjeerajarus
King Mongkut's University of Technology North Bangkok, Thailand

Abstract:

Amoxicillin is realized as significant drug due to their essential inhibition of bacterial infections. However, the effective time of amoxicillin in clinical position is less than 8 hours. Therefore, this research was to prolong the drug delivery system. Chitosan was modified by PCL (PCL/CS) microparticles were fabricated by oil in water emulsion (o/w emulsion) techniques for the protection and controlled the release of amoxicillin. The ratio of PCL: chitosan at different ratios were investigated for their influences on the zeta potential, size, morphology, swelling ratio and the release rate of amoxicillin from PCL/CS microparticles. The encapsulation efficiency was 74% to 83% and the maximum cumulative released amounts of amoxicillin from the PCL/CS at ratio 1:5 was about 6.5±0.03 mg for 7 days. Furthermore, the antimicrobial of amoxicillin was demonstrated by antimicrobial activity assays, which are effective in treating *Escherichia coli (E.coli)* and *Staphylococcus aureus (S.aureus).* The PCL/CS was enough for the bacterial inhibition growth of *E.coli* and *S. aureus*. The PCL/CS could be appropriate to supply a model

the drug delivery system for the medical application.



MT20-203-A
Title: Structural Aspects of ETP Grade Copper Metal Forming
Małgorzata Zasadzińska, Tadeusz Knych, Paweł Strzępek and Beata Smyrak
Faculty of Non-Ferrous Metals, Krakow, Poland

Abstract:

Recent technologies concerning metal forming processes of electrolytic tough pitch (ETP) grade copper which is the most commonly used material for electrical applications aim to maximize the efficiency and foolproofness of the continuous melting, casting and rolling process regarding not only ingots but also wire rods and finally wires and microwires. All this considered imposes a new set of requirements for batch material for the drawing process regarding deformability during the process as well as susceptibility to recrystallization which occurs in multi-wire drawing lines of high productivity in less than a fraction of a second. The copper wire rod which in fact is a composite made of Cu2O oxides in the copper matrix is manufactured from the batch copper ingot using industrial production lines. These oxides being a natural result of the solidification process have a significant impact on the strengthening mechanisms of the material during the drawing process.

The main part of this research paper was an analysis of the deformation conditions at each stage of the continuous melting, casting and rolling lines in terms of the structure evolution and morphology of copper oxides present in ingots, wire rods as well as manufactured copper wires of ETP grade. The scrupulous analysis of the shapes and dimensions of Cu2O oxides was conducted along with the analysis of the mechanisms of their fragmentation during the progressive reduction of the wires cross-section and the threats concerning the efficiency especially in highly strengthened wires of small diameters throughout the drawing process.

MT20-308
Title: Study Kinetics Models of Clindamycin Hydrochloride from Poly(D,L-lactic-co-glycolic acid) Particles
Chatchawan Soonklang, Chalermchai Tassanarangsan, Nopparuj Soomherun, Narumol Kreua-ongarjnukool and Saowapa Thumsing Niyomthai
King Mongkut's University of Technology North Bangkok, Thailand

Abstract:

The aim of this research is to study the models of Clindamycin hydrochloride encapsulating in poly(D,L-lactic-co-glycolic acid) particles (CLH/PLGA) kinetic. The CLH/PLGA particles were prepared by the double emulsion technique. The characterizations of CLH/PLGA particles were determined particle size, zeta potential, encapsulation efficiency, morphology, principle functional group, swelling, and *in vitro* drug release profile. The morphology of CLH/PLGA particles was the smooth and spherical shape. The maximum encapsulation efficiency of CLH/PLGA particles was 75% and the particle size of CLH/PLGA particles is from 216 to 222 nm and zeta potential value from -14.7 to -12.76 mV. The *in vitro* release of

CLH/PLGA particles was carried out in pH 6.8 and pH 7.4. The model drug release profile result was fitting with the kinetic mathematic model. In addition, the kinetic models of CLH/PLGA particles released in pH 6.8 and pH 7.4 were *First order model* and *Korsmeyer-Peppas model*. The investigated of the kinetic model also gave a better of the effect on the CLH release pattern.

MT20-242

Title: Effects of Glycine, L-arginine and Their Complexation with Polyvinylpyrrolidone on Tetrahydrofuran Hydrate Formation

Kesheng Rong, Xiaomei Shi, Jiaqin Gong, Qibing Wang, Kecheng Liu, Yuanzhi Qu and Xuyang Yao

Engineering Technology Research Institute of Xinjiang Oilfield Company, China

Abstract:

Hydrophilic amino acids as a new type hydrate inhibitor is a hot topic for scholars. In this paper, the influence of glycine and L-arginine, and their complexation with polyvinylpyrrolidone (PVP) on hydrate formation were clarified by tetrahydrofuran (THF) hydrate formation simulation experiments, and the intrinsic influence mechanism was revealed by many experimental methods. The results show that glycine has a strong inhibitory effect on water molecules because of its strong disturbance to water molecules, and the inhibitory effect is the best when the addition of glycine is 1.0 wt%. Due to the disturbance and binding of hydrophilic amino acids to water molecules, the effect of PVP on the semi-cage structure of water molecules as well as the adsorption and encapsulation of hydrate crystal particles, the combination of glycine and L-arginine and PVP has synergistic inhibitory effect on the formation of THF hydrate. When the total amount of hydrate inhibitor is 1.0 wt%, the synergistic inhibition ability of glycine and PVP is stronger. The results obtained in this paper provide an experimental and theoretical basis for the research and development of new hydrate inhibitors.

MT20-204-A

Title: The Influence of the Continuous Casting Conditions on the Properties of High Strength Two-Phase CuMg Alloys

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Abstract:

Constant tendency toward the improvement of the materials properties nowadays creates the opportunities for the researchers all over the world to design, form and manufacture new alloys almost every day. Considering the fact that companies all over the world desire alloys with the highest values of mechanical properties often coexisting with a reasonable electrical conductivity made it necessary to develop new materials based on Cu, such as CuMg alloys. However, before such new material may be mass produced it must undergo a series of tests in order to determine the production technology and its parameters. That is why the first stage of this research was to determine the influence of the continuous casting conditions on the chemical composition, microstructural properties and both mechanical and physical properties of CuMg alloys with 3; 4; 4.5; and 5 wt. % of magnesium. The research tests have shown that with the

increase of the casting feed the Vickers hardness of each material slightly increases (by 5 – 15 HV5). There is little to none impact of the casting feed on the electrical conductivity which values are between 20 and 25 MS/m (around 35 – 43% IACS) depending on the Mg content. The conducted SEM analysis has shown that the magnesium precipitations are evenly distributed among the volume of the alloy.

MT20-246
Title: Improvement of Poly(Lactic Acid) Properties by Ethylene-Octene Copolymer and Organoclay
Sirirat Wacharawichanant, Paweena Hanjai,Sanya Khongaio and Manop Phankokkruad
Silpakorn University, Thailand

Abstract:

The work studied the morphological, mechanical and thermal properties of poly(lactic acid) (PLA)/ethylene-octene copolymer (EOC) blends before and after adding the montmorillonite clay surface modified with 25-30% of octadecylamine (clay-ODA). The PLA/EOC blends and composites were prepared by melt mixing in an internal mixer. The EOC contents were 5, 10, 20, 30 wt% and clay-ODA contents were 1 and 3 phr. The morphology analysis showed that the addition of clay-ODA could improve the miscibility of PLA and EOC phases due to the domain size of dispersed EOC phase decreased with increasing clay-ODA content. X-ray diffraction revealed the formation of intercalated/exfoliated structure in PLA/clay-ODA and PLA blend composites. The mechanical properties showed that the impact strength of PLA/EOC blends dramatically increased with increasing EOC content up to 10 wt%. The strain at break of PLA blends increased with increasing EOC content. Moreover, the incorporation of clay-ODA increased significantly Young's modulus of PLA and PLA/EOC blends with increasing clay-ODA content. The thermal stability of PLA/EOC blends improved with the addition of a small amount of clay-ODA.

MT20-309
Title: Hybrid Gelatin/Carboxymethyl Cellulose Hydrogel Loaded Copper (II) ion for Medical Applications
Narumol Kreua-ongarjnukool, Saowapa Thumsing Niyomthai, Kodchaporn Sarodom, Thitithip Lothong and Nopparuj Soomherun
King Mongkut's University of Technology North Bangkok, Thailand

Abstract:

Antibacterial wound dressing has an important key in an infection in traumatic and surgical wounds. However, the antibacterial wound dressing is high cost and few domestic medical productions. The aim of this study is to prepare a wound dressing hydrogel from hybrid gelatin/carboxymethyl cellulose (Gel/CMC) hydrogel crosslinked with citric acid at different Gel: CMC ratios of 1:1, 1:2, 1:3, and 1:4 by solvent casting. The gel fractions and swelling of 6.0%w/v $CuSO_4$ loading hybrid Gel/CMC hydrogel (Cu-Gel/CMC hydrogel) were a maximum of about 44% to 53% and 85% to 245%, respectively. The results showed that the 1:1 Gel: CMC of hydrogel produce was the most suitable condition due to its good gel fractions and swelling behavior. The cumulative Cu^{2+} release was a maximum of about 45% in 7 days. The hybrid Cu-Gel/CMC hydrogel showed the zone of inhibition of *Staphylococcus* aureus (*S. aureus*) and *Escherichia coli* (*E. coli)* about 16 mm and 19 mm, sequentially. The research provided that the

hybrid Cu-Gel/CMC hydrogel has the potential to use in medical applications.

MT20-245
Title: Design Gearbox Transmission Picohydro for Hybrid Floating Power Plant
Tito Shantika, Farkhan Firdauzy Yusuf and M. Roedal Patriot
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Abstract:

The Hybrid Photovoltaic Picohydro power plant is an alternative power plant that is being developed, where the power plant consists of two sources of electricity, from solar and hydro energy. Picohydro was designed with a single axis shaft generator with turbine rotors, but both components have the same rotational speed. It's needed to use reduction gear for the appropriate speed generator specifications used. This research will achieved the picohydro power transmission system. Design gearbox will accordance with specification of generator. The study began with the design of gearbox components and then proceed with the manufacturing process. The design of a components will use FEA software. The results have transmission shaft 8 mm dimensions, with a transmission ratio of 2.5 using bevel gear, Pinion gear maximum stress about 296.7 Mpa, with material S45C obtained a FOS of 1.78.

MT20-310
Title: Enhancement Vehicles of Cardene Loading-Poly(D,L-lactic-co-glycolic acid) Nanoparticles in Vitro Controlled release for Biomedical Application
Nopparuj Soomherun, Narumol Kreua-ongarjnukool, Saowapa Thumsing Niyomthai and Sorayouth Chumnanvej
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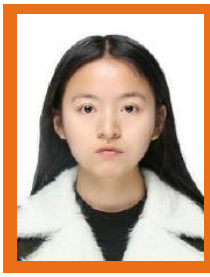
Abstract:

The goal of this research was to prepare a nanovehicles from poly(D,L-lactic-co-glycolic acid) nanoparticles (PLGA NPs) for delivering cardene. The cardene loading-PLGA NPs were fabricated by double emulsion and solvent evaporation process. PLGA has a monstrous interest to fabricate nanoparticles due to its good biodegradability and excellent biocompatibility. Drug loading and release profiles were performed as the model drug. The results appeared that cardene amount from 5.0 mg to 30.0 mg lead to the increase of the particle size, polydispersity index (PDI), and nanoparticle yield. The drug encapsulation efficiency was approximately 77% to 92%. The *in vitro* release from PLGA NPs was prolonged cardene concentration at periods more than 16 to 41 days. The cumulative drug release was a maximum of 40% to 70%. Moreover, the nanoparticles could be demonstrated biocompatible with the keratinocyte cells by MTT assay. The cardene loading-PLGA NPs were able to protect drug degradation and improve pharmacokinetics during transporting to the targeted organ. The cardene loading-PLGA NPs could be applied to prolonged drug delivery in biomedical applications.



MT20-502
Title: Strategies and Advances in Tumor Immunotherapy
Jing Luo
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Abstract:

Cancer is a serious threat to human health and is the most interesting research field at present. Compared to conventional treatments, tumor immunotherapy has a unique advantage in cancer treatment, favored by more and more outcomes from research or clinical trials of institutions and pharmaceutical companies, which is showing a booming trend recently. Due to the complexity of the immune system, tumor immunotherapy covers a variety of mechanisms and approaches, including immune checkpoint inhibition, vaccine-based therapies, adoptive T cell transfer, and therapeutic antibodies. Through the investigation of a large number of literature and database information, this paper focuses on the mechanisms and applications of current immunotherapies, aiming to explain the general trend and direction of tumor immunotherapy development.

MT20-344
Title: Investigation on Thermal Stability of Geopolymer Based Zeolite in Fire Case Study
Kanokwan Kanyalert, Prinya Chindaprasirt and Duangkanok Tanangteerapong
Khon Kaen University, Thailand

Abstract:

This work aims to reveal the effects of zeolite on properties of fly ash based geopolymer under high temperature at 300˚C, 600˚C and 900˚C. The specimens were prepared by alkali activation of fly ash, which was partially replaced by two different types of zeolite at 10%, 20% and 30% by weight**.** The specimens were analyzed for the maximum compressive strength, weight loss percentage, XRD and SEM. The results highlighted that the percentage of weight loss increased with the ratio of zeolite replacement. The compressive strength of geopolymer with synthetic zeolite and natural zeolite at 7, 28, 60 days were similar. The high-temperature exposure resulted in the reduction in compressive strength in all proportions. At the same temperature, compressive strength of all specimens were not significantly different.