

MEACM2017 CONFERENCE SCHEDULE

2017 International Conference on Mechanical Engineering and
Applied Composite Materials (MEACM2017)

Hong Kong, China



November 23-24, 2017

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X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

Simple Version of the Schedule

November 23rd

Conference Venue		REGAL ORIENTAL HOTEL, Hong Kong (香港富豪东方酒店)
Date & Time		Conference Schedule
2017, November 23, Thursday	14:00-17:00	Arrival and Conference Materials Collection

November 24th

Date & Time		Conference Schedule		
2017, November, 24, Friday	9:00-10:30	Keynote Session & Plenary Session		
	10:30-10:50	Tea Break & Photo		
	10:50-11:50	Keynote Session & Plenary Session		
	11:50-13:00	Lunch Break		
	13:00-13:30	Plenary Session		
	13:30-19:00	Session 1	Session 2	
		Mechanical Engineering	Applied Composite Materials	
			Poster session	

Note:

1. All the participants are strongly advised to arrive before 8:50, November 24, 2017.
2. Certificate of Participation can be collected at the registration counter at the Oriental Ballroom, 1/F.
3. Please copy IOP files of your presentation to the secretary when registration.



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

4. The organizer doesn't provide accommodation, and we suggest you make an early reservation.
5. If you want to deliver oral presentation but your paper is not in the session list, please contact us by Email: cfp@meacm.org

Instruction about Oral Presentation

Devices Provided by the Conference Organizer:

Laptops

Projectors & Screen

Laser Sticks

Materials Provided by the Presenters:

PowerPoint or PDF files

Duration of each Presentation-Regular Oral Session: about 10 Minutes of Presentation and 5 Minutes of Q&A



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Committees

Conference Chair

Professor Peng-Sheng Wei, National Sun Yat-Sen University, Kaohsiung,
Taiwan

Program Committee

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Dr. Mahendran Samykano, Universiti Malaysia Pahang, Malaysia

Prof. W.H. Katie Zhong, Washington State University, USA



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Assoc. Prof. Mohd Yazid bin Yahya, Universiti Teknologi Malaysia, Malaysia

Assoc. Prof. Tanveer Saleh CEng MIMechE, International Islamic University
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Dr. Azri Bin Alias, Universiti Malaysia Pahang, Malaysia

Dr. Seyed (Saeed) AhmadiSoleymani, University of Arizona, Tucson, Arizona

Assoc. Prof. Ir. Dr. Mohd Shukry Abdul Majid, Universiti Malaysia Perlis
(UniMAP), Malaysia

Dr. Prabhudev M. S, Dept of Mechanical Engg, Govt Polytechnic Kalg,
Karnataka, India

Prof. T. Stefan, the Technical University of Cluj-Napoca, Romania



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

Venue

REGAL ORIENTAL HOTEL (香港富豪东方酒店)

Address: 30 - 38 Sa Po Road, Kowloon City, Hong Kong

Telephone: (852) 2718 0333

Fax: (852) 2718 411

Email: info@oriental.regalhotel.com

Web: <https://www.regalhotel.com/>

Programme detail Friday, 24 November, 2017

Conference Schedule	
9:00-13:30	Keynote Session & Plenary Session
9:00-9:30	Keynote speech 1: Assoc Professor HAJIME HIRAO <i>Topic: Computationally Looking into Complex Metal-Organic Frameworks and Other Systems</i>
9:30-10:00	Keynote speech 2: Prof. Katsuyuki Kida <i>Topic: Changes in residual magnetic field caused by metal fatigue</i>
10:00-10:30	Plenary speech 1: Ass. Prof. LAU, Denvid <i>Topic: Understanding the mesoscopic packing of calcium-silicate-hydrate through the unit building block concept</i>
10:00-10:50	Tea Break & Photo
10:50-11:20	Plenary speech 2: Prof. C.W. Lim <i>Topic: Bi-Metal Casting: a Promising Technique for High Performance Journal Bearings Application</i>
11:20-11:50	Keynote speech 3: Prof Peng-Sheng Wei
11:50-13:00	Lunch Break
13:00-13:30	Plenary speech 3: Prof. Dong-Won Jung <i>Topic: The study of simulation for the hot roll forming process</i>
13:30-15:00	Session 1: Mechanical Engineering
15:00-15:20	Tea Break
15:20-16:20	Poster Session
16:20-19:00	Session 2: Applied Composite Materials



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

Keynote speech1

November 24, 2017 (9:00-9:30)



Associate Professor HAJIME HIRAO

**Department of Biology and Chemistry, College of Science and Engineering,
City University of Hong KongNational**

Speech Title: Computationally Looking into Complex Metal-Organic Frameworks and Other Systems

Dr. Hajime Hirao received his BEng and MEng degrees from Kyoto University and his PhD from The University of Tokyo. He underwent his postdoc training at The Hebrew University of Jerusalem, Emory University, and Kyoto University. Before joining City University of Hong Kong, he worked as faculty at Nanyang Technological University in Singapore. Over the years, he has been interested in computational and theoretical aspects of chemistry, especially chemical reactions. One of the major goals of his research is to figure out how difficult chemical transformations can be achieved using simple catalytic platforms built from earth-abundant elements.

Dr. Hirao's research applies quantum chemistry, multiscale models, and many other computational chemistry techniques to a variety of complex molecular systems of practical importance such as transition-metal catalysts, metalloenzymes, drugs/drug targets, porous materials, and nanomaterials. Using computational approaches and often with experimental collaborators, his group seeks to derive key insights into chemical reaction mechanisms and bonding patterns of complex molecules, with the ultimate aim of designing new functional molecules and materials. He is also interested in developing new concepts and computational methods that may enhance our understanding of chemistry or improve the efficiency of computational analyses



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

Keynote speech 2

November 24, 2017 (9:30-10:00)



Prof. Katsuyuki Kida

University of Toyama, Solid Mechanics Laboratory

Speech Title: Changes in residual magnetic field caused by metal fatigue

Prof. Katsuyuki Kida was born in 1968 in Osaka, where from 1988 he studied mechanical engineering at Osaka University. Apart from course work, he studied rolling contact fatigue (RCF) occurring in TiC and TiN coated steels using both X-ray diffraction and scanning acoustic microscopy. After graduation he pursued his academic career and completed a Ph.D. course in engineering mechanics in 2000, investigating RCF problems of all-Si₃N₄ bearings. By observing cracking and flaking failure under RCF, he succeeded in explaining the material's features from the viewpoint of fracture mechanics. From 2000 he focused his work on investigating the contact problems of elements used in automobiles such as high-pressure pump of new type diesel engines. He has also continued the fundamental research on contact problems, which received 'The Best Paper Prize (FFEMS PRIZE)' from 'Fatigue & Fracture of Engineering Materials & Structures' journal in 2005 and 'AML-Scientist Award' from 'Advanced Materials Letters' journal in 2011. The awarded papers reported establishing a crack growth mechanism under contact pressure, a problem that had not been solved for over 70 years since S. Way's theory. Prof. Kida has been honored with prestigious 'IAAM Medal' of year 2013 for notable and outstanding research in the field of materials science & technology at 'Advanced Materials World Congress (AMWC 2013, Cesme, Turkey, 16-19 September, 2013)' from International Association of Advanced Materials. His research interests now include the development of three dimensional scanning Hall-probe microscope technologies, fatigue phenomena in polymer bearing, crack growth mechanism under contact stresses and refinement of high-carbon steels. He holds



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

and has held a number of prestigious leadership roles in academy-industry corroboration programs : refinement of steels, new joint system in humanoid robots and fatigue of polymer bearing in "Strategic Fundamental Technologies Strengthening Assistance Programs" (Ministry of Economics, Trade and Industry, Japan, 2009-2013); scanning Hall-probe microscopy in "Fundamental Studies on Technologies for Steel Materials with Enhanced Strength and Functions" (Consortium of the JRCM, Japan, 2008-2012); and ceramic bearing elements in the project supported by "Japanese Energy and Industrial Technology Development Organization" (NEDO, Japan, 2007-2011).

Plenary speech 1

November 24, 2017 (10:00-10:30)



Ass. Prof. LAU, Denvid
City University of Hong Kong

Speech Title: Understanding the mesoscopic packing of calcium-silicate-hydrate through the unit building block concept

Denvid obtained his Bachelor degree with first class honors and Master degree in Civil Engineering from the University of Hong Kong (HKU) in 2004 and 2006 respectively, and got his second Master degree from the Department of Civil and Environmental Engineering (CEE) at Massachusetts Institute of Technology (MIT) in 2009. He then received his Ph.D. in the field of structures and materials from MIT in 2012. Prior to joining the City University of Hong Kong as an assistant professor in August 2012, he worked as a postdoctoral associate at MIT. Denvid got various awards and scholarships during his undergraduate and graduate studies including the Croucher Foundation Scholarship (2006-2009) and the Marvin E. Goody Award (2007). He was named as one of the Harvey Fellows in 2011. His research focuses on the multiscale modeling of organic-inorganic system, moisture-induced debonding, durability of concrete-epoxy system and fiber-reinforced polymer (FRP) composites in structural rehabilitation. To date, Denvid has attracted over HK\$5 million fund in total for research and teaching development. He



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

is currently the editorial board member of several international journals including Composites Part B: Engineering, which ranks top 5% in Engineering Multidisciplinary category in ISI. He has published more than 70 referred journal and conference articles and has delivered more than 20 invited talks around the world. Recently, Denvid has been nominated and selected as a Founding Member of the Young Academy of Sciences of Hong Kong (YASHK).



10:30-10:50

Photo & Coffee Break

Plenary speech2

November 24, 2017 (10:50-11:20)



Prof. C.W. Lim

City University of Hong Kong

Speech Title: Thermo-Acoustic Radiation of Free-standing Nano-thin Film in Viscous Fluid
Dr. Lim obtained a B.Eng. (1989) in Mechanical Engineering (Aeronautics) from Universiti Teknologi Malaysia (UTM), a M.Eng. (1992) in Mechanical Engineering from National University of Singapore (NUS) and a PhD (1995) in Mechanical Engineering from Nanyang Technological University (NTU), Singapore. From 1995 to 1997, he was a Postdoctoral Fellow at Department of Civil Engineering, The University of Queensland, Australia. He was later appointed as a Research Fellow at Department of Mechanical Engineering, The University of Hong Kong from December 1997. In February 2000, he joined Department of Building and Construction, City University of Hong Kong as an Assistant Professor and later promoted as an Associate Professor in February 2003. He is also a Guest Professor of Huazhong University of Science and Technology (HUST) since March 2006.

He is a member of American Society of Mechanical Engineers (ASME), American Society of Civil Engineers (ASCE), Acoustical Society of America (ASA) and Structural Engineering Institute of ASCE. He is also a member of The Hong Kong Institution of Mechanical Engineers (HKIE) and a Registered Professional Engineer (RPE). He has been listed in Marquis Who's Who in the World, Dictionary of International Biography and Marquis



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

Who's Who in Science and Engineering. Among the awards Dr. Lim has obtained are Best Academic Performance Medal in Mechanical Engineering (Aero) in 1989, University of Queensland Postdoctoral Fellowship (1996-97), University of Hong Kong Research Fellowship (1998-2000).

Keynote speech 3

November 24, 2017 (11:20-11:50)



Professor Peng-Sheng Wei

National Sun Yat-Sen University, Kaohsiung, Taiwan

Speech Title: Convection Effects on Pore Shape Development

Dr. Peng-Sheng Wei received Ph.D. in Mechanical Engineering Department at University of California, Davis, in 1984. He has been a professor in the Department of Mechanical and Electro-Mechanical Engineering of National Sun Yat-Sen University, Kaohsiung, Taiwan, China, since 1989. Dr. Wei has contributed to advancing understanding of and to the applications of electron and laser beam, plasma, and resistance welding through theoretical analyses coupled with verification experiments. Investigations also include studies of their thermal and fluid flow processes, and formations of the defects such as humping, rippling, spiking and porosity. Dr. Wei has published more than 70 journal papers. He is a Fellow of AWS (2007), and a Fellow of ASME (2000). He also received the Outstanding Research Achievement Awards from both the National Science Council (2004), and NSYSU (1991, 2001, 2004), the Outstanding Scholar Research Project Winner Award from National Science Council (2008), the Adams Memorial Membership Award from AWS (2008), the Warren F. Savage Memorial Award from AWS (2012), and the William Irrgang Memorial Award from AWS (2014). He has been the Xi-Wan Chair Professor of NSYSU since 2009.

11:50-13:00

Café Neo, B1, lunch



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

Plenary speech 4

November 24, 2017 (13:00-13:30)



Prof. Dong-Won Jung

Jeju National University, Department of Mechanical Engineering

Speech Title: The study of simulation for the hot roll forming process

Professor Dong-Won Jung works in School of Mechanical Engineering. He has rich experience in metal forming field. He is a professional reviewer of plenty Journals, such as KSME (Korean Society of Mechanical Engineers), KSPE(Korean Society for Precision Engineering), KSTP(Korean Society for Technology of Plasticity), KSAE(Korean Society for Automobile Engineers), Journal of Ocean Engineering and Technology, Journal of Korea Society for Power System Engineering, the Korean Journal of CAE, etc. He also has lot of publications and academic conference experiences.

Session List

Session 1

November 24, 2017 (13:30-15:00)

1. Paper ID: 44

Title: On DSS Implementation in the Dynamic Model of the Digital Oil field

Authors: Iakov S. Korovin, Maksim V. Khisamutdinov, Anatoly I. Kalyaev

Abstract: Decision support systems (DSS), especially based on the artificial intelligence (AI) techniques are been widely applied in different domains nowadays. In the paper we depict an approach of implementing DSS in to Digital Oil Field (DOF) dynamic model structure in order to reduce the human factor influence, considering the automation of all production processes to be the DOF model clue element. As the basic tool of data handling we propose the hybrid application on artificial neural networks and evolutionary algorithms.



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

2. Paper ID: ME110

Title: Simulation Modeling of the 4DL Reinforced Imperfect Composite Elastic Behavior

Authors: A E Dvoretzkiy, I V Magnitsky, F R Odinabekov, E S Sergeeva, S V Tashchilov

Abstract: Two models simulating the 4DL-reinforced imperfect material elastic behavior are analyzed. The model that involves direct introduction of an imperfect fiber-matrix contact is found to predict higher values for the compressive modulus of elasticity, rather than for the tensile one. This model also gives non-linear stress-strain diagram along some directions. Both models demonstrate a significant rigidity scale effect. Given the effects observed in actual practice with the materials of this class, conclusion was made about second model's usefulness in engineering practice

3-Paper ID: ME119

Title: Effect of the loading direction on energy absorption of pultruded glass-graphite/epoxy hybrid composites at high strain-rate.

Authors: Prabhakar R. Mantena

Abstract: High strain-rate tests were performed on cylindrical specimens to evaluate compressive strength along the longitudinal fiber direction. Transverse tensile strength was determined by diametral compression of disc samples (Brazilian indirect tensile test method). Diametral crack initiation and strain to failure were monitored with a Shimadzu HPV-2 high-speed video camera at a recording speed of 500,000 fps and Digital Image Correlation (DIC). Adequate measures were taken to ensure that initiation of specimen failure occurred at the exact center of the disc specimen, and propagated through the diameter along the compressive loading axis, for the induced transverse tension tests to be valid.

4- Paper ID: ME124

Title: Study of the nanoporous CHAP photoluminescence for developing the precise methods of early caries detection

Authors: D Goloshchapov, P Seredin, D Minakov, E Domashevskaya

Abstract: This paper deals with the luminescence characteristics of an analogue of the mineral component of dental enamel of the nanocrystalline B-type carbonate-substituted hydroxyapatite (CHAP) with 3D defects (i.e. nanopores of ~2-5 nm) on the nanocrystalline surface. The laser-induced luminescence of the synthesized CHAP samples was in the range of ~515 nm (~2.4 eV) and is due to CO₃ groups replacing the PO₄ group. It was found that the intensity of the luminescence of the CHAP is caused by



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

structurally incorporated CO₃ groups in the HAP structure. Furthermore, the intensity of the luminescence also decreases as the number of the above intracentre defects (CO₃) in the apatite structure declines. These results are potentially promising for developing the foundations for precise methods for the early detection of caries in human solid dental tissue

5- Paper ID: ME125

Title: Increasing of the lifetime of large forging dies by repairwelding

Authors: M Duchek, Koukolikova M, J Kotous, M Majer

Abstract: Repair welding is often used for rebuilding discarded or failed forging dies. It saves the cost of new tools. Increased useful life of repaired dies is another motivation for repair welding. This article focuses on the development of new filler materials for this purpose. The main goal was to prolong the life of tools of DIN 1.2714 material. Filler wires of two chemistries were made and several samples were experimentally welded. Metallographic and tribological analyses were carried out.

6- Paper ID: ME128

Title: Sensitive Characteristics Study of Triple-electrode Carbon Nanotube Sensor Array to Mixed Gases

Authors: Y Zhang, ZZ Cheng, QY Chen, LL Ke, X Song, JM Tong, BD Liang

Abstract: NO₂, NO and SO₂ produced by industrial combustion process are the main sources of atmospheric pollution. Almost all available technologies of measuring the three components in gas mixtures are limited by cross-sensitivity. Here we report an array with three triple-electrode carbon nanotube sensors and its sensitivity to the three flue gas components. Each sensor operates at the same mechanism and is comprised of a cathode, an extracting electrode and a collecting electrode, and is set by different electrode separations with 75 μm, 100 μm and 120 μm, respectively. We explored voltages influence on the sensitivity applied on electrodes, and simultaneously obtained distinct single-valued sensitive characteristics to the three-component gases at given voltages. With a high level of integration and a small size, the array displays a potential to detect concentrations of different components of gas mixtures. Keywords: Carbon nanotubes; ionization; sensor arrays; mixed gases; detection

7- Paper ID: ME130

Title: Porous carbon electrodes with enhanced fraction of meso-size pores for capacitive deionization



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

Authors: Jang-Uk CHOI, Jin-Soo PARK

Abstract: In this study, we fabricated carbon electrodes through mixed two different carbon powders with different sizes to investigate the effect of electrochemical properties of the electrodes fabricated with various combination of two carbon powders in weight. The characteristics of adsorption, desorption and electrode reactions were investigated by measuring conductivity, effluent pH, and current. Moreover, cyclic voltammetry(CV), chronoamperometry(CA), and electrochemical impedance spectroscopy (EIS) were applied to characterize the electrochemical properties of the electrodes.

8- Paper ID: ME144

Title: Influence of repeated quenching-tempering on spheroidized carbide area in JIS SUJ2 bearing steel

Authors: K Egawa, I Yoshida, H Yoshida, K Mizobe, K Kida

Abstract: High-carbon high-strength JIS-SUJ2 bearing steel is mainly used for rolling contact applications which require high fatigue strength. We had applied repeated quenching which refine the prior austenite grains to this steel. In this work, we prepared JIS SUJ2 bearing steel bar specimens which were quenched three times (Q₃T₁) and quenched-tempered three times (QTQTQT) in order to investigate the influence of tempering before quenching on the microstructure. The specimens were etched by picral to observe the microstructure. We found that the spheroidized carbide area was important for the prior austenite grain formation.

9- Paper ID: ME145

Title: Effect of observation position of SUJ2 bar specimens on inclusions distribution

Authors: T Kamiya, K Mizobe, K Kida

Abstract: The size and distribution of non-metallic inclusions are strongly related to rolling contact fatigue (RCF) life. SUJ2 steel is manufactured as a round bar, and is cooled from the surface during casting. This indicates that the inclusions may be distributed non-uniformly in the center direction. The objective of this study is a clarification of the difference of the inclusion distribution in the SUJ2 round bar. It was found that the distribution of inclusions in SUJ2 was distributed uniformly in a transverse direction.



15:00-15:20

Coffee Break

Poster Session

November 24, 2017 (15:20-16:20)

1. Paper ID:ME102

Title: Fabrication of BiFeO₃/LaNiO₃ epitaxial Superlattice Structure by RF sputtering

Authors: Y. T. Liu, H. Y. Lee, S. Y. Chen

Abstract: Artificial superlattice structures consisting of alternating epitaxial layers of materials with dissimilar physical properties offer exciting new possibilities both in the investigation of fundamental physical phenomena and in the exploitation of novel properties for various applications. In this work, symmetric superlattice structures of multiferroic BiFeO₃ (BFO) and conductive LaNiO₃ (LNO) sublayers were grown on Nb-doped SrTiO₃ substrate with rf magnetron sputtering at temperature 660 oC. The superlattices contained 6 – 30 periods of BFO/LNO bilayers with a sublayer thickness in a range of 2 – 10 nm. The total thickness of the films was fixed at ~ 120 nm.

The formation of a superlattice structure was confirmed from the appearance of Bragg peaks separated by Kiessig fringes in x-ray reflectivity curve and a diffraction pattern. X-ray reflectivity curve show both the superlattice peaks and the Kiessig oscillations, which were well pronounced, reveal the presence of a well-ordered layer structure of a superlattice, providing evidence for a vertically periodic modulation of the composition. X-ray measurements show that these superlattice films become subject to greater tensile stress along the c-axis, increased compressive stress parallel to the surface plane with decreasing the thickness of sublayer.

The BFO sulayer in the artificial superlattice is under biaxial compressive stress whereas the LNO sulayer is under biaxial tensile stress. The superlatttice films with 2nm thickness of sublayer shows there is the largest strain state and the best crystalline quality with the largest remanent polarization. The smaller is the thickness of sublayer,



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

the narrower is FWHM of the in-plane rocking curve and the greater is the crystalline quality. The measurement of hysteresis loops shows the evaluated remanent polarization decrease with increasing stacking periodicity. From a macroscopic point of view, the strain in this superlattice structure contributes significantly to the enhancement of remanent polarization.

2-Paper ID: ME109

Title: Cumulative fatigue life prediction of glass/polypropylene/aluminum foam sandwich panels

Authors: Yi-Ming Jen¹, Han Chen

Abstract: The two stage cumulative bending fatigue testes of the studied sandwich specimens were performed using an MTS 810 material testing system with a four-point bending jig. Several prediction methods were employed to evaluate the cumulative fatigue lives.

3-Paper ID: ME111

Title: Study on the effects of salt on the behaviors of the rubber damper in compression

Authors: Yung-Chuan Chiou, Chia-Chin Wu, Jenng-Chun Yu

Abstract: The damage due to the salt on the tested rubber is produced via the method of salt spray testing based on CNS 8886 standard. Here, both one-day and five-day duration of performing the salt spray test, are adopted to induce the different extent of salt damage on the tested rubber dampers in the present study. Subsequently, the hardening test and the monotonic test in compression are conducted on the tested dampers with/without the salt effect, respectively.

4-Paper ID: ME134

Title: UO₂ fuel pellets fabrication via Spark Plasma Sintering using non-standard molybdenum die

Authors: E K Papynov, O O Shichalin, A Yu Mironenko, I G Tananaev, V A Avramenko, V I Sergienko

Abstract: The article investigates spark plasma sintering (SPS) of commercial uranium dioxide (UO₂) powder of ceramic origin into highly dense fuel pellets using non-standard die instead of usual graphite die. An alternative and formerly unknown method has been suggested to fabricate UO₂ fuel pellets by SPS for excluding of typical problems related to undesirable carbon diffusion. Influence of SPS parameters on chemical composition and quality of UO₂ pellets has been studied. Also main advantages and drawbacks have been revealed for SPS consolidation of UO₂ in non-standard molybdenum die. The



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

method is very promising due to high quality of the final product (density 97.5-98.4% from theoretical, absence of carbon traces, mean grain size below 3 μm) and mild sintering conditions (temperature 1100 °C, pressure 141.5 MPa, sintering time 25 min). The results are interesting for development and probable application of SPS in large-scale production of nuclear ceramic fuel.

5-Paper ID: ME135

Title: Manganese Oxide-Based Sorbent for Sr-90 Radionuclide Removal from Seawater

Authors: E K Papynov, A M Egorin, T A Sokolnitskaya, D V Marinin, Y A Azarova, A S Portnyagin, M I Balanov, D S Misko, E A Shelestiuk, A M Kalashnikova, E A Tokar, I G Tananaev, V A Avramenko

Abstract: The morphology, specific surface area, and sorption properties toward Sr-90 radionuclides in seawater of a sorption material based on manganese oxide have been investigated. The material was fabricated through interaction of KMnO_4 and H_2O_2 with subsequent annealing at 500 °C. The sorbent is characterized with the mechanical strength sufficient for using under dynamic sorption conditions: here, the efficiency of Sr-90 removal at feeding of 150 bed volumes exceeds 95 %. The values of Sr-90 distribution coefficients are equal to 0.8–1.2 $\times 10^3$ ml/g in the real seawater and to 1.6-1.8 $\times 10^3$ ml/g in the simulated one.

6-Paper ID: ME136

Title: SPS-RS technique for solid-phase “in situ” synthesis of biocompatible ZrO_2 porous ceramics

Authors: O O Shichalin, M A Medkov, D N Grishchenko, V Yu Mayorov, A N Fedorets, A A Belov, A V Golub, E A Gridasova, E K Papynov

Abstract: The prospective method of spark plasma sintering-reaction synthesis (SPS-RS) for fabrication of ceramics based on ZrO_2 and biocompatible with living tissue is presented. Nanostructured ceramics has high mechanical strength (more than 400 MPa) and controlled porosity depending on specified sintering conditions. Biocompatible phases $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ are formed “in situ” during SPS sintering of ZrO_2 powder due to chemical interaction of phosphate precursors preliminary introduced into the mixture. The effective method to improve (to develop) porous structure of bioceramics obtained by SPS or SPS-RS techniques using poreforming agent (carbon black) is proposed. Suggested original SPS-RS “in situ” technique provides fabrication of new ZrO_2 ceramics containing biocompatible phosphate components and possessing unique structural and mechanical characteristics. Such ceramics is indispensable for bone-ceramic implants that



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

are able to activate processes of osteogenesis during bone tissue recovery.

7-Paper ID: 13

Title: Effects of annealing conditions on photoluminescence properties of sol-gel derived ZnMgO films

Authors: Chin-Hau Chia, Ching-Wen Chang

Abstract: In this study, we investigated the evolution of photoluminescence spectra from ZnMgO films, as a function of preheating and post-annealing temperature during the sol-gel growth. Two-series of $Zn_{1-x}Mg_xO$ films with Mg-concentration $x=0.13$ were grown on sapphire substrate by using water as solvent and citric acid as stabilizer. One series of samples were grown under conventional annealing procedures by holding the post-annealing temperature and changing the pre-heating temperature. Another series of samples were grown alternative annealing procedures by maintaining both pre-heating and post-annealing temperature. We found that the annealing procedures have a great impact on the photoluminescence characteristic of ZnMgO films. Temperature-dependent and excitation-density-dependent photoluminescence spectroscopies were employed to study the origins and mechanism of those emission bands. Judging from spectral position and width, we found that the optimum temperature to grow $Zn_{1-x}Mg_xO$ films is about $650^{\circ}C$.

8-Paper ID: 37

Title: An Experimental Study on the Rail Deformation in Linear Roller Bearing Subjected to External Load

Authors: Jun-Ho Heo, Sun-Woong Kwon, Seong-Wook Hong

Abstract: The rail deformation inside the bearing block with respect to a vertical load was estimated by the difference between the measured block deformation and the calculated block deformation from a commercial program that does not account for the rail flexibility. The rail deformation outside the bearing block was also measured to make a complete rail deformation curve due to vertical load.

9-Paper ID: ME138

Title: Effects of surface modification on surface morphology of rubber

Authors: Yun-Chi Liu, Maw-Tien Lee

Abstract: In this study the rubber prepared to be the rubber bumper in the harbor was used in the experiments. The as-received rubber was pretreated with the alkaline solution, the acid solution, and acetone individually. All the rubber samples mentioned



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

above were then treated with sodium silicate (Na_2SiO_3) and calcium nitrate ($\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$) solution to cause a precipitation of CaSiO_3 on the surface of rubber. The abrasion test was conducted to understand the attachment of calcium silicate on rubber surface. An atomic force microscopy (AFM) was used to investigate the surface morphology of the samples.

10-Paper ID: 31

Title: Mechanical Properties of TiC/420 Stainless Steel by Laser Cladding

Authors: Chun-Ming Lin*

Abstract: The CO_2 laser cladding layer was blown on medium carbon steel with the mixture of the titanium carbide and 420 stainless steel powders was investigated. The influence of titanium carbide content on microstructure and wear performance of the cladding layer was studied. The experimental result showed that inter-run porosities existed inside cladding layer when the addition of titanium carbide was about 40 wt.%, while solidification cavities appeared, as the addition of titanium carbide was about 30 wt.%. The cladding layer hardness was significantly increasing with the increase of titanium carbide content from 0 wt.% to 30 wt.%. Premier wear mechanism of the cladding layer wearied form adhesive and abrasive to surface fatigue with the increasing of titanium carbide content. The addition of titanium carbide significantly improved wear resistance of cladding layer in 7kgf load and 1.5m/s sliding speed. However, in the condition of 3kgf load and 1.5m/s sliding speed, the additions of titanium carbide decreased wear resistance. Hence, the microstructure and wear performance approach presented in this study provides a useful basis for the design and optimization of laser-clad coatings.

11-Paper ID: ME112

Title: Manufacturing process design of multi-pass shape drawing process

Authors: Sang-Kon Lee, In-Kyu Lee, Sun-Yun Lee, Myeong-Sik Jeong, Jae-Wook Lee, Da Hye Kim, Yong-Jae Cho, Sun-Kwang Hwang

Abstract: The program can be installed on AutoCAD V14. Because of simple graphic user interface, the user can operate it very easily. By using this program, intermediate die shape, drawing load, drawing stress, drawing strain, die angle, reduction in area can be determined or calculated. Additionally, the drawing of die can be plotted in AutoCAD through post-process. The developed program was applied to design the shape drawing processes for two profiles. Finally, in order to verify the effectiveness of the results, FE analysis and shape drawing experiment were carried out.



Session List

Session 2

November 24, 2017 (16:20-19:00)

1- Paper ID: ME127

Title: Simulation based optimization on automated fibre placement process

Authors: Lei Shi

Abstract: In this paper, a software simulation (Autodesk TruPlan & TruFiber) based method is proposed to optimize the automate fibre placement (AFP) process. Different types of manufacturability analysis are introduced to predict potential defects. Advanced fibre path generation algorithms are compared with respect to geometrically different parts. Major manufacturing data have been taken into consideration prior to the tool paths generation to achieve high success rate of manufacturing.

2- Paper ID: ME147

Title: Interaction of chlorine adatom with lithium adatom on opposite sides of graphene

Authors: Meifeng Dong, Xinxiang Song

Abstract: Using first principles density functional theory under the generalized gradient approximation, we study chlorine (Cl) and lithium (Li) adatoms co-adsorption properties on opposite sides of single-layer graphene. The adsorption system become more stable and Cl adatom collects more charge from graphene. But due to the effects of graphene, the interaction between Li and Cl adatoms is weakened and the lost charge of Li adatom is not all transferred from graphene to Cl adatom

3- Paper ID: 8

Title: A study on variable friction model in sheet metal forming

Authors: Ji Yun Kang, Jithin Ambarayil Joy, Dong Won Jung

Abstract: Conventional Coulomb model assumes constant friction coefficient in sheet metal forming simulation. It tends to predict too high shear stress in forming advanced high R-value steel (AHRS). The study is conducted by simulating the forming and spring back of a specific panel to understand the characteristic of the stamping process. Comparison of the predicted results with (i) pressure-dependent variable friction model, (ii) constant friction model, and the result of experimental verification indicates a significant improvement of spring back prediction with the proposed model.



4. Paper ID: 17

Title: Abrasive wear of Hilong BoTN hardfacings

Authors: L Fedorova, S Fedorov, A Sadovnikov, Y Ivanova, M Voronina

Abstract: The spread of steels, which are used to produce locks of steel drill pipes, adversely affects their wear resistance, which, in combination with low hardness of HV 2400 ... 2800 MPa as well as of the thread of screw, results in low wear resistance and the need for their reconstruction at the pipe control shop. An efficient way of improving the quality of drill pipe joints is to hard-face them by the outside diameter with wear-resistant materials (hardbanding). One of the companies engaged in the development of hardfacing materials and hardbanding is Hilong (China) with weld seams of the brand BoTn. According to the results of the studies the following conclusion can be made: hardfacing increases the durability of the hardware, contributing to an increase in wear resistance of locks of DP under the conditions of abrasive action of aggressive geological formations; the usage of DP without wear-resistant weld seams is impermissible, because their further operation, as part of the drill-stem, can lead to emergency consequences; application of the pipes with the hardfacing collars together with the collars without hardfacing, due to varying degree of wear of joints in the drill-stem, is also impermissible.

5-Paper ID: 18

Title: Molecular dynamics study on nano-sized wiredrawing: possible atomistic process and application to pearlitic steel wire.

Authors: K Saitoh, K Yoshida, K Oda, T Sato, M Takuma, Y Takahashi

Abstract: The process of nano-sized wiredrawing is investigated by using molecular dynamics (MD) simulation in this study. The authors have constructed novel computation models of wiredrawing, in which a single wire of just a several nanometers in diameter is smoothly drawn through a perfectly rigid die together with lubrication mechanism and is forced to be shaped into thinner one. Interatomic potentials used in MD simulation is a conventional pairwise type useable for iron-carbon binary system (for pearlitic steel). For MD model of pearlite steel wire, it is recognized that ferrite-cementite interface effectively offers high-speed diffusion path for carbon atoms from cementite side to ferrite side (elementary mechanism of cementite decomposition). As conclusion, we showed by using atomistic simulation that nano-sized wiredrawing process is theoretically quite possible.



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

6- Paper ID: 19

Title: Improvement of corrosion resistance of low-alloy steels by resurfacing using multifunction cavitation in water

Authors: Masataka Ijiri, Toshihiko Yoshimura

Abstract: Low-alloy steels are based on carbon steel in combination with several percent or less (in many cases, 1 mass%) alloying elements, and they offer improved resistance to corrosion at a cost slightly higher than that of carbon steel. However, these materials do not exhibit the same corrosion resistance as stainless steel. The authors have previously developed a novel multifunction cavitation (MFC) technique, which combines ultrasonic cavitation with water jet cavitation. In this study, MFC was used to modify the surface of Cr-Mo steel (SCM435) and Ni-Cr-Mo steel (SNCM630). MFC was found to improve the residual stress value of the material as the result of surface modification while also imparting high strength and superior corrosion resistance.

7- Paper ID: 28

Title: Examination of thermophotovoltaic GaSb cell technology in low and medium temperatures waste heat

Authors: Z Utlu, B S Önal

Abstract: In this study, waste heat was evaluated and examined by means of thermo-photovoltaic systems with the application of energy production potential GaSb cells. The aim of our study is to examine GaSb cell technology at low and medium temperature waste heat. The evaluation of the waste heat to be used in the system is designed to be used in the electricity, industry and iron and steel industry. Our work is research. Graphic analysis is done with Matlab program. The low and medium temperature waste heat graphs applied on the GaSb cell are in the results section. Our study aims to provide a source for future studies.

8- Paper ID: 29

Title: Performance evaluation of thermophotovoltaic GaSb cell technology in high temperature waste heat

Authors: Z Utlu, B S Önal

Abstract: In this study, waste heat was evaluated and examined by means of thermo-photovoltaic systems with the application of energy production potential GaSb cells. The aim of our study is to examine GaSb cell technology at high temperature waste heat. The evaluation of the waste heat to be used in the system is designed to be used in



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

the electricity, industry and iron and steel industry. Our work is research. Graphic analysis is done with Matlab program. The high temperature waste heat graphs applied on the GaSb cell are in the results section. Our study aims to provide a source for future studies.

9- Paper ID: 38

Title: Study on heat transfer performance of water-borne and oily graphene coatings using anti-/de-icing component

Authors: Long Chen, Yidu Zhang, Qiong Wu, Zhang Jie

Abstract: A graphene coating anti-/de-icing experiment was proposed by employing water-borne and oily graphene coatings on the composite material anti-/de-icing component. Considering the characteristics of helicopter rotor sensitivity to icing, a new graphene coating enhancing thermal conductivity of anti-/de-icing component was proposed. The anti-/de-icing experiment was conducted to validate the effectiveness of graphene coating. The results of the experiment show that the graphene coatings play a prominent role in controlling the heat transfer of anti-/de-icing component. The anti-/de-icing effect of oily graphene coating is superior to water-borne graphene.

10- Paper ID: ME108

Title: Wa-Chair: A concept for development of economical stair-climbing wheelchair

Authors: Nayan Jyoti Baishya, Harutoshi Ogai

Abstract: In this paper, a concept for development of cost effective and reliable stair climbing wheelchair is being proposed. Slider-crank mechanism is being used to compensate for any variation in inclination angle of the wheelchair during ascent or descent on stairs. Controlling wheelchair's inclination angle can reduce risk for the rider as it prevents the wheelchair from toppling. A prototype is being developed to validate proposed mechanism. Proposed mechanism allows rider to view in the direction of progress which adds additional safety to the rider.

11- Paper ID: 46

Title: Characterization of some engineering properties of materials leading to instability in Constantine Province, Algeria

Authors: B Ykhlef, A Belouar, A Boulfoul

Abstract: In Constantine Province, (Algeria), sensitive clays presenting shrinkage-swelling and sliding phenomena are widespread, covering large areas. Due to this, constructions and infrastructures sustainability built on such soils is questionable. Such clays sensitivity is amplified by seasonal rainfall which can reach extreme magnitude causing damages to such structures. In order to understand their behaviour, a large campaign of geotechnical



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characterization has been done using samples from this area. The specific gravity, Atterberg limits, coefficient of lateral earth pressure at rest were determined. Samples were tested in triaxial, over a range of stress with test being either stress or strain controlled leading to sliding phenomena under different stress levels. The results of this investigation indicate that the properties of clays in Constantine's region are similar to those of clays from many parts of the world, such as London basin; they can be classified as overconsolidated soils. The test programme undertaken indicated also that K_0 is directly related to the stress history of the soil and dependent upon the state of the sample prior to testing.

12- Paper ID: 52

Title: Perm State University HPC-hardware and software services: capabilities for aircraft engine aeroacoustics problems solving

Authors: A G Demenev

Abstract: The present work is devoted to analyze high-performance computing (HPC) infrastructure capabilities for aircraft engine aeroacoustics problems solving at Perm State University. We explore here the ability to develop new computational aeroacoustics methods/solvers for computer-aided engineering (CAE) systems to handle complicated industrial problems of engine noise prediction. Leading aircraft engine engineering company, including "UEC-Aviadvigatel" JSC (our industrial partners in Perm, Russia), require that methods/solvers to optimize geometry of aircraft engine for fan noise reduction. We analysed Perm State University HPC-hardware resources and software services to use efficiently. The performed results demonstrate that Perm State University HPC-infrastructure are mature enough to face out industrial-like problems of development CAE-system with HPC-method and CFD-solvers.

13- Paper ID: 25

Title: Effect of Dimension and Shape of Magnet on the Performance AC Generator with Translation Motion

Authors: A. Indriani, Dimas, S, Hendra

Abstract: The development of power plants using the energy from renewable energy sources is very rapid. Renewable energy sources used solar energy, wind energy, ocean wave energy and other energy. All of these renewable energy sources require a processing device or a change of motion system to become electrical energy, energy storage media and the media modifier of AC to DC. One processing device is a generator.



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Generators work on the principle of converting motion (mechanical) energy into electrical energy with rotary shaft, blade and other motion components. Generator consists of several types of rotation motion and linear motion (translational). The generator consists of several building components such as rotor, stator and anchor. In the rotor and stator having magnet and winding coil as an electric generating part of the electric motion force. Working principle of AC generator with linear motion (translation) also apply the principle of Faraday that is using magnetic induction which change iron magnet to produce magnetic flux. Magnetic flux is captured by the stator to be converted into electrical energy. Linear motion generators consist of linear induction machine, wound synchronous machine field, and permanent magnet synchronous [1]. Performance of synchronous generator of translation motion is influenced by magnet type, magnetic shape, coil winding, magnetic and coil spacing and others. In this paper, we will focus on the neodymium magnet with round, trapezium and rectangle shapes with varying number of coil windings and magnetic distances. This generator is used in pneumatic mechanism (PLTGL) for power plants system. Test of performance of AC generator translation motion obtained that maximum voltage, current and power are 63 Volt for diameter winding coil 0.15 mm, number of winding coil 13000 and distance of magnet 20 mm. For effect shape of magnet, maximum voltage happen on rectangle magnet 30x20x5 mm with 4.64 Volt. Voltage and power on effect of diameter winding coil is 14.63 V and 17.82 W at the diameter winding coil 0.7 and number of winding coil is 1260 with the distance of magnet 25 mm.

14- Paper ID: 30

Title: Performance of Control System Using Microcontroller for Sea Water Circulation

Authors: A. Indriani, Y. Witanto, A. Pratama, S. Supriyadi, Hendra

Abstract: Control system is often used to set a system to work automatically and quickly. Control system consists of open loop and closed loop. Open loop has several advantages compared to closed control system. The advantages are simple construction, easy for maintenance, cheaper, no stability problem. In closed control for maintenance system requires feedback from the output system [1]. Control system can be designed and created using some control facilities such as programmable logic control (PLC), microcontroller and others. Control system uses some programming languages such as assembler language, computer language, C + + language, ladder diagram and others. Performance control system is influenced by control equipment, sensor sensitivity, test condition, environment and others. In this paper focused on control equipment using



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microcontroller Arduino Mega, test conditions as well as environment for the control of sea water circulation. Sea water circulation is done in the shape of drainage of sea water from clean water pool water using water pump. The control system indicator ordered to pump active to circulate sea water is temperature sensor, sea water clarity, PH shows the value that passes the input threshold of the setting of sea water conditions. The temperature sensor is measured using the DS18S20 sensor and the seawater clarity sensor with turbidity sensor. From the test results indicated that this control system can circulate sea water and maintain the temperature and clarity of seawater in a short time.

15- Paper ID: 26

Title: CONTROL SYSTEMS OF RUBBER DRYER MACHINERY COMPONENTS USING PROGRAMMABLE LOGIC CONTROL (PLC)

Authors: Hendra, A. S. Yulianto, A. Indriani, Hernadewita, dan Hermiyetti⁴

Abstract: Programmable logic control (PLC) is widely used for engine component control systems in the automotive, aviation, food processing and other industries [1-2]. PLC sets the component motion system with programming language using ladder program. Where the use of ladder program on the system motion of the component has advantages that is simpler, easy, flexible and can be changed more quickly. PLC in this paper is used to set the motion system and sensor components on the drying process of rubber. Where the components to be driven are motors, temperature sensors, dry detection sensors and color from dry rubber content form. PLC used is Smart Relay Zelio type. The PLC regulates the movement of wet rubber in and out in the form of dry rubber. Changes in dry rubber content are adjusted by adjusting the temperature in the drying chamber. Drying system uses greenhouse effect by making hanger dryer design in the form of line path. In this paper focused on motion control system motors and sensors dry rubber. From the test results obtained the control system can work in accordance with the control input given and the time required to dry the rubber with the dimensions of 100 x 50 mm from the initial temperature of 32 °C to the final temperature of 70.20C is 109 minutes and 766 w electric power. The water content and final weight of the rubber were 0% and 30 grams while the initial condition of wet rubber was 23-26% for moisture content and weight of 40 grams



X-academy 2017 International Conference on Mechanical Engineering and Applied Composite Materials

16- Paper ID: 50

Title: Effect of aluminum contents on sputter deposited CrAlN thin films

Authors: A Vyas, Z F Zhou, Y G Shen

Abstract: Pure CrN and CrAlN films with various Al contents were prepared onto Si(100) substrates by an unbalanced reactive dc-magnetron sputtering system. The crystal structure, chemical states, microstructure and mechanical properties of the films were characterized by X-ray diffraction, X-ray photoelectron microscopy, transmission electron microscopy and nano-indentation measurements. XRD results showed a prominent (200) reflection in both CrN and CrAlN films. Results demonstrate that CrAlN films formed a solid solution and doping of Al atoms replace the Cr atoms affecting the lattice parameter and crystallization of the films. All Al doped films were of B1 NaCl-type structure, demonstrating that CrAlN films primarily crystallized in cubic structure. Microstructural investigation by TEM for a CrAlN film containing Al content of 24.1 at.%, revealed that there exists an amorphous/nanocrystalline domains (grains of about 11 nm) and hardness increases 22% when compared with pure CrN film.

17- Paper ID: 34

Title: Simulation Analysis of 25A-Size Corrugated Metal Gasket Coated Copper to Increase Its Performance

Authors: Didik Nurhadiyanto, Mujiyono, Sutopo, Febrianto Amri Ristadi

Abstract: In previous study many researcher investigated on 25A-size corrugated metal gasket using material SUS304 and it modified. The elastic model design of corrugated metal gasket still leakage and need high axial force for tightening process. The purpose of this study is to analyze coated corrugated metal gasket by FEM simulation. The characteristic of coating material should softer than base material. The coating material will stick and fill in the surface roughness of gasket. The simulation result shows that contact width increase and contact stress decrease after the gasket coated by copper. It mean that the gasket performance will increase to stop the leakage.

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Thank you for all of your contributions!