ICMSSM2021

2021 7th International Conference on Mechanical Structures and Smart Materials

June 15, 2021| Changsha, China

http://www.icmssm.org/

Welcome Messages

Dear colleagues,

It is our great pleasure and privilege to welcome you to the virtual edition of ICMSSM2021, the 2021 7th International Conference on Mechanical Structures and Smart Materials. The conference will be held on June 15th, 2021 and is now accessible to registered participants worldwide.

On this great gathering, Organizing Committee invites participants from all over the globe to take part in this annual conference. The aim of ICMSSM2021 is to provide a platform for researchers, engineers, and academicians, as well as industrial professionals, to present their research results and development activities in Mechanical Structures and Smart Materials Related Issue. This conference provides opportunities for the delegates to exchange new ideas and application experiences, to establish business or research relations and to find global partners for future collaboration.

Papers submitted to ICMSSM2021 will be reviewed by technical committees of the conference. All accepted and registered papers will be published in "Materials Science Forum" [ISSN print 0255-5476 ISSN cd 1662-9760 ISSN web 1662-9752, Trans Tech Publications]. And the press will submit all papers to major databases such as EI Compendex, Scopus and Scholar...

We would like to thank and welcome everyone, and hope you will enjoy ICMSSM2021.

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Note:

- All the participants are strongly advised to attend 10 minutes before the Webinar is start.
- Zoom ID and instructions will also be sent 7 days before the conference.
- The standard time for all programs is China Time

Instructions about Oral Presentation

- Materials Provided by the Presenters: PowerPoint or PDF files
- Duration of each Presentation: Regular Oral Session: About 10 Minutes of Presentation and 2 Minutes of Q&A.

Committee

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Prof. Yan Zhang, Xi'an University of Science and Technology, China

Technical Program Committee

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Qingsong Xu, University of Macau, China
Abbas Bahrami, TNO innovation for life, Netherland
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Mostafa Omidi Bidgoli, I slamic azad university, Iran
AHMED MANCY MOS, Al- Mansour University, Baghdad
Nabisab Mujawar Mubarak, Curtin University, Malaysia
Weishen Chu, The University of Texas at Austin,USA
Hamid Khayyam, RMIT University, Australia

Time Schedule (Chinese Standard Time, GMT+8)

June 15th, 2021

09:25-09:30	**Opening Speech**
09:30-15:30	**Plenary & Keynote Session**
09:30-10:00	**Versatile Carbon Dots: Syntheses, Characterizations and Applications** Prof. Roger M. Leblanc | University of Miami, USA
10:00-10:30	**Optically Reconfigurable Architected Nanomaterials** Prof. Yuebing Zheng | The University of Texas at Austin, USA
10:30-11:00	**Recent progress in catalytic performance of Fe-based metallic glasses in wastewater treatment** Prof. Lai-Chang Zhang | Edith Cowan University, Australia
11:00-11:30	**Tool Path Generation Framework for Modeling Numerical Simulation of Incremental Sheet Forming Process** Prof. Dong-Won Jung | Jeju national University, South Korea
11:30-12:00	**Chemical and Physical Effect of Nanocarbons on Polymer Nanocomposites** Prof. Seira Morimune-Moriya| Kobe University, Japan
12:00-13:00	**Break**
13:00-13:30	**Tuning the Spatially Controlled Growth, Structural Self-Organizing and Cluster-Assembling of the Carbyne-Enriched Nanostructured Metamaterials During Ion-Assisted Pulse-Plasma Deposition** Dr. Alexander Lukin| Western-Caucasus Research Center, Russia
13:30-14:00	**Topological transitions in superconductor nanomembranes under a strong transport current** Prof. Vladimir M. Fomin | the Institute for Integrative Nanosciences (IIN), Leibniz Institute for Solid State and Materials Research (IFW) Dresden, Germany
14:00-14:30	**Nanoscale modelling of polymer electrolytes for solid-state batteries** Dr. Javier Carrasco | CIC Energigune, Spain
14:30-15:00	**High output power in smart µ-thermoelectric generators design** Prof. Bertrand Lenoir | Institut Jean Lamour, UMR 7198 CNRS – Université de Lorraine, France
15:00-15:30	**Smart Materials and Structures** Prof. Peter Cochrane OBE | The University of Suffolk, UK

15:30-17:10	Paper Session
Paper ID SM703	**Paris correction model considering the influence of stress ratio on material parameters** Chenjiashuo | Chang' an University, China
SM706	**Hydrothermal fabrication of BiVO4/ diatomite composite photocatalysts and their photocatalytic performance** Junfeng Ma | North China Electric Power University, China
SM707	**Wafer Direct Technology for mini LED flip attachment** Kazuo Hiraki | Suzuki Co., Ltd., Japan
SM711	**Preparation of M2SiO4:Tb3+,Mn2+,Nd3+ white-emitting phosphors (M = Mg2+, Ca2+, Sr2+, and Ba2+) and the influence of M2+ cations on their luminescent performance** Junfeng Ma | North China Electric Power University, China
SM720	**Study on low temperature conduction mechanism of Al doped ZnO/SiO2/p-Si heterojunction** Zhou Xiaoyan| China University of Petroleum, China
SM722	**Influence of the different combination of diameters of two tool heads on forming quality in double sided incremental forming** Prof. Dong Won Jung|Jeju National University, South Korea
SM725	**Stages of Coalescence of Droplets in Miscible Liquids** Prof. Dong Won Jung|Jeju National University, South Korea
35	**Experimental and numerical examination on formability and microstructure of AA3003-H18 alloy in single point incremental forming process** Prof. Dong Won Jung|Jeju National University, South Korea
36	**THE METHOD OF CONSTRUCTING A MULTIDIMENSIONAL MODEL FOR FINDING THE VALUES OF THE PARAMETERS OF THE INCREMENTAL SHEET FORMING PROCESS** Prof. Dong Won Jung|Jeju National University, South Korea
37	**The potential use of brick wastes in the generation of new materials for construction through geopolymerization processes** Ramiro Correa-Jaramillo|Universidad Politécnica de Madrid, España

Plenary & Keynote Speakers

Prof. Roger M. Leblanc

Department of Chemistry, University of Miami, USA

Roger M. Leblanc received his B. S. in chemistry in 1964 from Université Laval, Canada, and Ph. D. in physical chemistry in1968 from the same university. From 1968 to 1970, he was a postdoctoral fellow in the laboratory of Prof. George Porter, FRS, in Davy Faraday Research Lab, the Royal Institution of Great Britain. He was a professor from 1970 to 1993 at Department of Chemistry and Biology in Université du Québec à Trois Rivières, Canada. During this period, he was Chair from 1971 to 1975 at the same department, and Director from 1981 to 1991 at Photobiophysics Research Center. In 1994, he moved to University of Miami, where he has been a professor at Department of Chemistry since then. At University of Miami, he was Chair of Department of Chemistry from 1994 to 2002, and he is reappointed as Chair from 2013 to present. He is also Professor (Second Appointment) of the Department of Dermatology and Cutaneous Surgery, Miller School of Medicine, University of Miami (Miami, Florida, USA) and Department of Physics, University of Miami (Coral Gables, Florida, USA). In addition, he is Senior Fellow of the University of Miami Center on Aging (COA) (Coral Gables, Florida, USA).

Prof. Yuebing Zheng

The University of Texas at Austin, USA

Yuebing Zheng is an Associate Professor of Mechanical Engineering and Materials Science & Engineering at the University of Texas at Austin. He is holding the William W. Hagerty Fellowship in Engineering. He is directing Zheng Research Group (http://zheng.engr.utexas.edu), which focuses on innovating optical manipulation, manufacturing, and measurement for quantum, nano, and biological world. He received his Ph.D. in Engineering Science and Mechanics (with Prof. Tony Jun Huang) from the Pennsylvania State University, USA, in 2010. He was a postdoctoral researcher in Chemistry and Biochemistry (with Prof. Paul S. Weiss) at the University of California, Los Angeles from 2010 to 2013.

Prof. Lai-Chang Zhang

School of Engineering, Edith Cowan University, Australia

Lai-Chang Zhang is a Professor of Materials Engineering and the Program Leader–Mechanical Engineering in the School of Engineering at Edith Cowan University (Perth, Australia). After awarded his PhD in Materials Science and Engineering at the Institute of Metal Research, Chinese Academy of Sciences, Prof. Zhang held several positions at The University of Western Australian, University of Wollongong, IFW Dresden and Technische Universität Darmstadt. His research interests include metal additive manufacturing, light-weight alloys, nanocrystalline materials and metallic glasses, and nanomaterials for water treatment. He has published more than about 280 referred journal papers with an H-index of 60 and 10000+ citations and 22 ESI Highly Cited Papers. He also served as Editor or Editorial Board Members many journals, e.g. Advanced Engineering Materials, Metals (IF: 2.117), Frontiers in Materials, Materials Science and Technology, etc.

Prof. Dong-Won Jung

Jeju National University, South Korea

Professor Dong-Won Jung works in School of Mechancial 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.

Dr. Seira Morimune-Moriya

Kobe University, Japan

EDUCATION
Kobe University, Kobe, Hyogo, JAPAN Ph.D in Engineering September, 2013
KTH Royal Institute of Technology, Stockholm, SWEDEN Visiting researcher March, 2012 – March, 2013
Research Experience
Chubu University, Kasugai, Aichi, JAPAN April, 2018 - present
Senior assistant professor
Directing Polymer Composites Group
Polymer/nanocarbon nanocomposites
Develop high functional-high performance polymer nanocomposites using nanocarbons such as nanodiamond, graphene, and carbon nanotubes. Control surface characteristics of nanocarbons by chemical modifications.
Conductive polymer composites
Develop high conductive polymer composites using PEDOT:PSS.Reveal conductive mechanism of PEDOT:PSS with secondary dopant.
Environmentally friendly polymer composites
Develop high functional-high performance environmentally friendly polymer nanocomposites using cellulose nanofiber, chitosan and collagen.

Dr. Alexander Lukin

Western-Caucasus Research Center, Russia

Dr Lukin got a M.S. degree (Rocket Propulsion Engineer) from Izhevsk State Technical University with the Diploma of Excellence (1985) and Ph.D. degree (Phys. & Math.) from the Physics-Technical Institute of the Ural Branch of the Russian Academy of Sciences (1993). Dr. Lukin was involved in critically-important research programs associated with the development of the solid propulsion systems that support the upper stages of intercontinental ballistic rockets. Dr. Lukin is Associate Fellow and Lifetime Member of the American Institute of Aeronautics and Astronautics (AIAA), International Member of the AIAA Solid Rockets Technical Committee (SRTC); Member of the AIAA United Nations Committee On Peaceful Uses of Outer Space (UN-COPUOS) Working Group (WG); Member of the International Advisory Committee of the State Key Laboratory for Modification of Chemical Fibers and Polymer Materials (SKLFPM) in Donghua University, Shanghai, China; Professor-Advisor of the Shaanxi Research Institute of Applied Physics-Chemistry, China; Academic Consultant of the North-Western Polytechnic University, China; Member of the National Graphene Association (NGA). Dr Alexander Lukin is Expert of the Russian Academy of Sciences, Expert of Federal Register of Experts of the Ministry of Education and Science of the Russian Federation in the area of Space and Transport Systems, Honorary Fellow and Chair of the Research Sub-committee of the Academic Council of the Australian Institute of High Energetic Materials (Sippy Downs, Australia).

Prof. Vladimir M. Fomin

the Institute for Integrative Nanosciences (IIN), Leibniz Institute for Solid State and Materials Research (IFW) Dresden, Germany

Vladimir M. Fomin, Principal Researcher at the Institute for Integrative Nanosciences (IIN), Leibniz Institute for Solid State and Materials Research (IFW) Dresden. Member of APS, German Physical Society, European Physical Society, IEEE, MRS, Nanoscale Superconductivity COST Action (European Cooperation in Science and Technology), Mediterranean Institute of Fundamental Physics. Doctoral studies in Kishinev at the Department of Theoretical Physics of the State University of Moldova. Ph.D. in theoretical physics in 1978. Work in the Lab. "Physics of Multi-Layer Structures" at the State University of Moldova (from scientific researcher to director). Research interests: non-linear optical properties and transport due to the charge-vibrational interaction in semiconductors and in multi-layer structures, including derivation of the phonon spectra and the electron–phonon interaction; classification of polaritons and phonons; polaronic, bipolaronic and excitonic effects in arbitrary multi-layer structures. State Prize of Moldova 1987. Dr. habilitat in physical and mathematical sciences (Academy of Sciences of Moldova, 1990). University Professor in Theoretical Physics (State University of Moldova, since 1995). Research Fellow of the Alexander von Humboldt Foundation (Martin-Luther-University of Halle, 1993–1994). Research at the Lab. Theoretical Solid State Physics (University of Antwerp, 1995–2008) and the Group Photonics and Semiconductor Nanophysics (Eindhoven University of Technology, 1998–1999, 2003–2007), Division Quantum and Physical Chemistry (Catholic University of Leuven, 2008), Faculty of Physics (University of Duisburg-Essen, Duisburg, 2008–2009), IIN IFW-Dresden (since 2009). Diploma of a Scientific Discovery of the Phenomenon of the Propagation of Spatially-Extended Interface Phonon Polaritons in Composite Superlattices (Academy of Natural Sciences of Russia, 1999). Medal "Academician P. L. Kapitsa" (Academy of Natural Sciences of Russia, 2000). Honorary Member of the Academy of Sciences of Moldova (2007). Scientific interests in nanophysics: theory of strain-induced self-rolled nano-architectures, in particular, physical properties of self-assembled nano- and microstructures (quantum rings, superlattices of quantum dots, rolled-up semiconductor and superconductor membranes), optical properties of quantum dots, persistent currents and magnetization of quantum rings; topological defects, phase boundaries and vortex matter in meso-, nanoscopic and patterned superconductors; superconducting properties of metallic nanograins; surface-induced magnetic anisotropy in mesoscopic systems of dilute magnetic alloys; quantum transport in sub-0.1 micron semiconductor devices; vibrational excitations and polaronic effects in nanostructures; thermoelectric properties of semiconductor nanostructures. 6 monographs, including "Self-rolled micro- and nanoarchitectures: Effects of topology and geometry", De Gruyter, 2021; "Physics of Quantum Rings" (Editor), Springer, 2014; 2nd edition, Springer International Publishing, 2018, 3 textbooks, 13 review papers, 10 patents and more than 200 scientific articles.

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Dr. Javier Carrasco

CIC Energigune, Spain

Dr. Javier Carrasco obtained his PhD in 2006 from the Universitat de Barcelona. His Ph.D thesis was devoted to the theoretical description of point defects in metal oxides using ab initio quantum chemistry methods. In 2007 he joined the Theory Department of the Fritz Haber Institute of the Max Planck Society, Berlin, as an Alexander von Humboldt fellow, working in the area of water-metal interfaces using density functional theory. In 2009 he moved to University College London, London, as a Newton International fellow. During this time he focused his research on the molecular-level understanding of ice formation on metal surfaces. Following this, in 2011 he moved to Instituto de Catálisis y Petroleoquímica del Consejo Superior de Investigaciones Científicas, Madrid, as a Ramón y Cajal fellow. Much of his work during this time was centred upon theoretical catalysis for hydrogen production and hydrogenation of hydrocarbons, as well as the application of van de Waals density functionals to molecular adsorption on metal and oxide surfaces. Since September 2013 he leads the Computational Studies group at the CIC Energigune. His research aims at understanding important phenomena in surface-, materials-, and nano-science in the power storage field. Using concepts from quantum mechanics, solid state physics, and statistical mechanics, he applies and develops methods and computer simulations to study processes of relevance to energy materials - such as the properties of ion insertion and extraction in electrodes and chemical reactions at surfaces. Rechargeable batteries and fuel cells are major focuses of his work.

Prof. Bertrand Lenoir

UMR 7198 CNRS – Université de Lorraine, France

Professor Bertrand Lenoir completed his PhD from Lorraine University (France) and has been teaching Physics and Materials Science at Ecole Nationale Supérieure des Mines de Nancy (France) since 1994. His research, performed at Institut Jean Lamour (France), focuses on experimental studies of thermoelectric properties in a variety of materials. Much of recent efforts have been directed towards the identification and exploration of novel thermoelectric materials and to the development of modules for electrical power generation from waste heat. He has published more than 180 publications in international peer-review journals and is serving as an Editor or Editorial Board Member for Energy, Applied Sciences, Materials, Open Physics.

Prof. Peter Cochrane OBE

The University of Suffolk, UK

A seasoned professional with decades of hands on management, technology and operational experience, Peter progressed from linesman to Head of Research and CTO at BT where his 1000 strong team engaged in studies spanning optical fibre, fixed and mobile networks, complex systems, AI, AL, future products, human behaviour and interfaces. On leaving BT in 2000 he formed his own consultancy and an investment career involving eBookers, Shazam Entertainment, and a raft of smaller start ups. Peter has also been employed in the defence, logistics, travel, retail, energy, healthcare, transport and pharma sectors. As an advisor he has been engaged by UK, Singapore and Qatar government departments; he has also advised HP, Motorola, 3M, Dupont, Ford, Sun, Apple, Cisco, Rolls Royce, BMW, Jersey Telecom, Chorus, QCRI and FaceBook et al. In 2017 Peter was appointed Professor of Sentient Systems to the University of Suffolk, and he is also a visiting Professor to The University of Herfordshire, Salford, and Nottingham Trent University. Throughout his career Peter has received numerous awards including the IEEE Millennium Medal, Martlesham Medal, Prince Philip Medal, Queens Award for Export and Technology and an OBE. Numerous universities have also awarded Peter honorary degrees.

Paper Session

Paper ID: SM703
Title: Paris correction model considering the influence of stress ratio on material parameters
Abstract:
The stress ratio R is one of the important driving forces in the prediction of fatigue crack growth rate. At present, many fatigue crack growth rate models considering the stress ratio R essentially propose the relationship between the material parameters C and m of Paris model and the stress ratio R, but many models only study the value of material parameter C. In order to establish a more accurate fatigue crack growth rate model, the current material parameter selection methods are reviewed in this paper, and the fatigue crack growth rate data of 2024-T4, 2324-T39, 2524-T3 and 6082-T651 aluminum alloys under different stress ratios are used for verification. Then by analyzing the fatigue crack growth rate data of 2024-T4 aluminum alloy, ASTM A516 Gr.70 steel and ADB610 steel under different stress ratios, the value equations of material parameters C and m are proposed, and a new fatigue crack growth rate model is proposed. Finally, the reliability of the model is verified by the fatigue crack growth rate data of 7075-T6 aluminum alloy. Using the test data under R=0.2, 0.33, 0.5 and 0.8, the fatigue crack growth rate model at R=0.7 is predicted. The results show that R2 = 0.955, RSME = 0.123, which is very close to the Paris model. The fatigue crack growth rate data of Ti-6Al-4V alloy were used to compare the accuracy of the Huang Xiaoping model, the Li Yazhi model and the model in this paper. The results show that the Huang Xiaoping model R2min = 0.7017, RMSEmax = 0.2328, the Li Yazhi model R2min = 0.1266, RMSEmax = 0.3984, the proposed model R2min = 0.9675, RMSEmax = 0.1315, that is, the model in this paper has higher accuracy.

Paper ID: SM706
Title: Hydrothermal fabrication of BiVO4/ diatomite composite photocatalysts and their photocatalytic performance
Abstract:
A hydrothermal process was proposed to prepare BiVO4/ diatomite composite photocatalysts, where BiVO4 was grown from a precursor solution containing diatomite, and EDTA used as a chelating agent to prevent the precipitation of precursor solution compositions on diatomite before hydrothermal treatment. The effect of some processing parameters like diatomite percentage and Ag-loaded amount on their photocatalytic performance were also investigated in detail by X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), BET, and UV-Vis spectroscopy. The results show that BiVO4/ diatomite composite photocatalysts can be successfully prepared at 160 °C for the duration of 3h by the hydrothermal process. The diatomite has two significant impacts on their photocatalytic performance: (1) enhancing the dispersion of BiVO4 crystallites due to its high porosity and specific surface area to favor their photocatalytic performance, and (2) having a light screening effect to incident visible light to decrease their photocatalytic activity. Appropriately incorporating diatomite could improve their photocatalytic performance, but the overuse of diatomite would reduce that. Similarly, depositing Ag could effectively improve their photocatalytic activity because of its good light absorption and photosensitive characteristics, but excessive addition would result in their decrease since the overuse of Ag would also promote the electron-hole recombination.

Paper ID: SM707

Title: Wafer Direct Technology for mini LED flip attachment

Abstract:

We would like to introduce the mechanism structure of our wafer direct die attachment technology for mini LED. Wafer direct technology is structured from two parts of that one is adhesive one shot dipping and other is pinhole free chip shooting. Generally, chip dipping is used for supplying of ACP, flux, solder or any adhesive to chip one by one which is very useful to optimize supply volume of adhesive. But ordinary chip dipping is difficult to shorten dipping time due to that transfer of any adhesive to chip by surface tension take a time. Slow dipping cycle time become bottleneck of productivity. Mini LED chips are existing around 30,000chips on single wafer that take extremely long time. We developed "One shot wafer dipping" which improved productivity of mini LED chip dipping process more than hundred times. We succeeded to transfer the adhesive to around 30,000 chips of mini LED on a wafer at once. We would like to explain you the mechanism of "One shot wafer dipping" for mini LED chip bonding process as first section. Second section is to take about die mounting. Common die bonder use an ejector pin to pick up mini LED chip. Ejector pin makes a pinhole on wafer and lead air into between wafer and mini LED chip. This air is effective to remove mini LED chip from wafer by the pick up nozzle. And making pinholes on wafer leads to shift of location of each mini LEDs on wafer due to expansion of wafer by pinholes which influences to pick up accuracy of mini LED chips. Ejector pin of die bonder leaves a pin mark and a broken piece of wafer at electrodes. A piece of broken wafer remains at electrodes and captured into inside of adhesive as contamination. The contamination at electrodes will be a cause of cluck, corrosion or oxidation which disturbs mini LED lighting. And a pin mark at electrodes by ejector pin is some of physical damage. Thickness of electrodes of mini LED is just a few micron meters which cannot be endured any physical contact. Such damage remains on passivation layer and it's appear after sometime as current leakage. We would like to eliminate potential anxiety of physical damage by mechanical structure. So we developed wafer direct chip shooting technology. Wafer direct chip shooter also use an ejector pin for shooting down mini LED chip. But wafer direct does not make any pinhole on wafer that means no broken piece of wafer exists. And an ejector pin of wafer direct does not touch to any electrodes due to that mini LED chip electrodes are located at opposite side of pin ejection. Our wafer direct technology maximize productivity of mini LED die bonding and minimize faulty ratio of mini LED die bonding.

Paper ID: SM711

Title: Preparation of M2SiO4:Tb3+,Mn2+,Nd3+ white-emitting phosphors (M = Mg2+, Ca2+, Sr2+, and Ba2+) and the influence of M2+ cations on their luminescent performance

Abstract:

M2SiO4: Tb3+, Mn2+, Nd3+ (M = Mg2+, Ca2+, Sr2+, and Ba2+) phosphors suitable for near-ultraviolet-violet radiation excitation were successfully prepared at 1400 ℃ in N2 atmosphere by a high-temperature solid-state reaction, and their phase compositions and luminescent performance were also studied by X-ray diffraction (XRD), photoluminescence spectra. Results show that their emission intensity increases in the order of Ca2SiO4 > Mg2SiO4 > Sr2SiO4 > Ba2SiO4 matrix phosphor. Ca1.94SiO4: 0.02Tb3 +, 0.02Mn2+, 0.02Nd2+ phosphor exhibits the best luminescence performance.

Paper ID: SM720
Title: Study on low temperature conduction mechanism of Al doped ZnO/SiO2/p-Si heterojunction
Abstract:
The 3 at% Al doped ZnO thin films were deposited on p-Si substrate with a native SiO2 layer by spray pyrolysis method. Low temperature conduction behaviors were studied by analysis of impedance spectroscopy and low temperature ac conductivity. The results of impedance spectroscopy showed that the grain boundaries contributed to the resistivity of Al doped ZnO/SiO2/p-Si heterojunction. The calculated activation energy was 0.073 eV for grain boundaries. The equivalent circuit to demonstrate the electrical properties of Al doped ZnO/SiO2/p-Si heterojunction was a series connection of two parallel combination circuits of a resistor and a universal capacitor. Low temperature ac conductivity measurements indicated that the conductivity increased with temperature. Low temperature conductivity mechanism was electron conductivity, the activation energy was 0.086 eV.

Paper ID: SM722
Title: Influence of the different combination of diameters of two tool heads on forming quality in double sided incremental forming
Abstract:
The existing double sided incremental forming (DSIF) mostly uses two tools with the same diameter as the upper/lower tools, which is not conducive to improve the forming quality and forming efficiency. In this paper, the influence of the different combination of the upper and lower tool head diameters on the thickness distribution and the contour dimension accuracy of the formed part is studied by using ANSYS / LS-DYNA software and by taking the model with bidirectional convex features as the research object. It is found that the reasonable combination of different diameters of the upper/lower tools based on the characteristics of the parts to be formed can improve the forming quality and forming efficiency.

Paper ID: SM725
Title: Stages of Coalescence of Droplets in Miscible Liquids
Abstract:
The coalescence of miscible liquids happens in various stages. The paper is the theoretical analysis of the stages of coalescence with change in position of drop of the liquid. Substages in the coalescence are explained to an extent in the work. The change in potential energy of the liquid droplet results in the jet formation accompanied with crown. Equation for the relation between height of the jet formation and droplet size is discussed with experimental validation. We assumed the droplets in the crown as an individual jet formation with a droplet on top of it. The symmetricity of crown formation is considered in our study to reduce the complexity of any sort. We have also tried to fit the profile with equations in the cascading of the droplets.

Paper ID: 35

Title: Experimental and numerical examination on formability and microstructure of AA3003-H18 alloy in single point incremental forming process

Abstract:

The single-point incremental forming process has witnessed significant advantages in automobiles, aerospace, and medical applications in recent years because of its flexibility in manufacturing complex shapes. In detail, the components are produced only using the toolpath, which is guided by computer-aided manufacturing software. However, during the forming process, the parts might experience fractures, which could heavily impact the formed part's geometric accuracy. The main purpose of this study is to analyze the formability of an AA3003-H18 aluminum alloy material in the SPIF process; for this purpose, the material properties are extracted from the experimental simple tensile test in three directions corresponding to the material rolling direction. At first, a simple tensile test is modeled and estimated the material properties for conducting the numerical simulations. Second, the real-time experiments of the SPIF process in terms of predefined forming conditions are performed, and then the surface roughness was measured to check the surface quality of the formed parts. Then, the formed parts are scanned using a 3D ATOS scanner and compared against the desired computer-aided design (CAD) model. Eventually, the numerical results are discussed in comparison with the experimental outcome and displayed a significant correlation toward the expected results. This results comparison communicates that the introduced finite element (FE) model can be adopted for investigating the appearance of thinning location, thinning reduction, distributions of stress and strain. The overall results show that satisfying material formability in better surface finish and geometric dimensional accuracy can be accomplished when the forming conditions are designed appropriately.

Paper ID: 36

Title: THE METHOD OF CONSTRUCTING A MULTIDIMENSIONAL MODEL FOR FINDING THE VALUES OF THE PARAMETERS OF THE INCREMENTAL SHEET FORMING PROCESS

Abstract:

The object of research is geometric models of the process of incremental forming of parts from sheet material. The subject of research is a graphical model for finding the optimal values of the parameters of the forming process based on multidimensional descriptive geometry. The author of the article discusses the main optimizing factors and process parameters. Particular attention was paid to the problems of constructing geometric models for determining the optimizing factors for incremental forming. The research method is a way of constructing a graphical optimization model of the process using the projection drawing of Radishchev for multidimensional space. Mathematical modeling was also applied to check the correctness of the obtained optimal parameters.

Paper ID: 37

Title: The potential use of brick wastes in the generation of new materials for construction through geopolymerization processes

Abstract:

The calcined clay bricks are the second most used materials in construction that, after the demolition processes, tends to become rubble, generating a negative visual and environmental impact, in addition to the fact that the brick-making process has not been industrialized in Ecuador, for that, its properties are deficient; in this way, the present research aims to study the physical, chemical and mineralogical characteristics of brick waste from the Southern part of this country, as a viable raw material for the manufacture of ecological bricks through geopolymerization processes, using as alkaline activator Sodium Hydroxide at temperature ranged between 90 °C and 200 °C, obtaining an optimal mixture at the combination 12.5 M, 26 wt% Cs, 150 °C. The mechanical properties of bricks as simple compression and flexural strength, respectively, applying the experimental Griffith criterion method by finite element simulation method. These ecological bricks obtained are suitable for use in construction.

Poster Session

Paper ID: 4
Title: Measuring and Testing Composite Materials Used in Aircraft Construction
Abstract:
This paper is focused on the use of special composite materials for the construction of aircraft components. It focuses on measuring and testing the strength of reinforced composite materials used in damaged aircraft parts repairs. To determine the layer required to repair a part of the aircraft, it is necessary to know the strength limit of the material and its parts. The article describes experimental measurements of manufactured composite samples that have been subjected to tensile stress. Aim of the performed tensile tests was to determine the maximum tensile stress that the composite materials are able to transmit until they are damaged. Measurement determining the maximum stress level is important to ensure the required safety of the aircraft structure on which the composite structure was repaired.

Paper ID: 14
Title: Effects of Dressing Parameters on Material Removal Rate in Grinding of Hardened SKD11 Alloy Steel using CBN Wheel
Abstract:
In the grinding process, the dressing plays a vital role in ensuring the topography and performance of the grinding wheel. This study examines the effect of some critical parameters of dressing on material removal rate in grinding SKD 11 alloy steel using CBN wheels. The Taguchi method is used to organize experiments as well as provide statistical analysis. The dressing parameters chosen are the dressing depth, the dressing spindle speed, and the dressing feed rate. The CBN grinding wheel was dressed in a condition with three levels of the dressing depth (from 0.01 to 0.03 mm), three levels of the dressing spindle speed (from 500 to 2000 rpm), and three levels of the dressing feed rate (from 100 to 800 mm/min). The optimum conditions of the dressing have been achieved for the maximum material removal rates. Along with that, an analysis of variance (ANOVA) was performed to assess the appropriateness of the empirical model. The results show that the dressing spindle speed is the parameter that has the greatest influence on MRR, followed by the dressing depth.

Paper ID: 16
Title: Experimental Studying the Influence of CBN Dressing Parameters when Convex Shaped Grinding SKD11 Tool Steel
Abstract:
The aim of this study is to find the optimum set of dressing parameters which can generate minimum surface roughness when carrying grinding process of SKD11 hardened steel by CBN grinding wheel. The selected input parameters are dressing depth, dressing feed rate and dressing spindle. The optimization process will be validated by experiments which are planned to test by using Taguchi method. It is found that dressing depth has the largest effect on surface roughness, and the influential percent is 74.37%. The influences of dressing feed rate and dressing spindle speed follow by 13.07% and 6.28% respectively. Additionally, it is showed that the difference between experiments and predictions are minor when showing the deviation of 8.06%. This can be considered that it is possible to utilize Taguchi method in order to study experiments and predictions in case of grinding SKD11 hardened steel by CBN grinding wheel.

Paper ID: 17

Title: IMPACTS OF DRESSING PARAMETERS ON THE MATERIAL REMOVAL RATE WHEN CONDUCTING THE INTERNAL GRINDING OF HARDENED SKD11 STELL

Abstract:

Dressing process has significant effects on the grinding operations when considering the profile accuracy, the topography, and the grinding wheel wear. This study aims to optimize the internal grinding process of hardened SKD11 steel to find the optimum set of dressing parameters that can maximize material removal rate. The input parameters used are Coarse dressing depth, Number of coarse dressing, Fine dressing depth, Number of Fine dressing, Non-feeding dressing, and Dressing feed speed. Taguchi method is utilized to plan for experiments for validating predictions. It is found that the number of coarse dressing has the most influential percent of 65.83% on the MRR. Moreover, the consistency between predictions and experiments is confirmed by the Anderson-Darling checking method. It can be said that the proposed method can be further applied in other studies.

Paper ID: 18

Title: STUDYING THE IMPACTS OF PROCESS PARAMETERS ON THE COST OF BLASTING PROCESS USING BORON CARBIDE NOZZLE

Abstract:

The aims of this study are to find out an optimum set of data minimizing cleaning cost for the abrasive blasting system with boron carbide nozzle. Nozzle wear rate per hour, Time for changing a nozzle, Compressive power are chosen as input parameters to optimize for finding the maximum lifetime of nozzle as well as minimum cleaning cost. A screening experiment is developed. The results show that Compressive power have dominant effect on the cleaning cost, while two remaining process parameters have minor impacts on the response. The cleaning cost maximizes of 4.108 USD/m2 at Nozzle wear rate per hour of 10-3 mm/h, Time for changing a nozzle of 10 min, and Compressive power of 1030 kW.

Paper ID: 11

Title: Investigation of The Effect of Modifying the AlSi7Mg0.3 Alloy with A Fast-Cooled Master Alloy Using Heat Treatment

Abstract:

The development of modern high-tech industries of industrial production is impossible without the development of new methods for processing materials with high mechanical characteristics. There is a growing need for an increase in the proportion of parts made of aluminum alloys, a more complex configuration of cast parts, an increase in their reliability and durability in operation, etc. All this poses for metallurgists and foundry workers the task of creating new technologies for producing alloys, improving the technical and economic characteristics of structural materials, improving the quality and reducing the cost of castings.Hypoeutectic silumins have good casting properties, good weldability, machinability and corrosion resistance. However, they are prone to the formation of a coarse needle-like state, which reduces their useful characteristics. To eliminate this phenomenon, it is necessary to apply special technologies and the most common is their modification, which provides grain refinement. This makes it possible to use silumins for the manufacture of castings of complex shapes with increased density and low shrinkage porosity. Such parts can withstand average loads in critical units. Aluminum-silicon alloy AK7 or (ASi7Mg0.3) is a typical silumin, which is in demand in the automotive industry, construction, aircraft construction, machine, automobile and tractor production. It is appreciated for its good casting properties, weldability, machinability and corrosion resistance.

Paper ID: 12
Title: Increasing the Efficiency of Production of Synthetic Cast Iron Castings
Abstract:
The main factor that determines the content of the development strategies of a modern foundry is the use of modern technological processes, especially melting technology. First of all, this applies to the production of iron castings, which make up 65% of the mass of all alloys. Since 2000, in Russia, there has been a sharp decrease in the amount of pig iron scrap, the cost of foundry and pig iron and the cost of their transportation have increased significantly. This led to an increase in material costs in the production of castings from synthetic iron, which was mainly obtained in crucible induction furnaces of industrial frequency (ICT). In addition, problems began to arise with the use of acidic lining as the cheapest and most durable, since an increased amount of steel scrap began to be used in the metal charge, and for this reason the melting temperature was raised above 1450 ° C. The durability of the lining has sharply decreased, and downtime associated with its replacement has increased. All this had a negative impact on the efficiency of the production of synthetic iron castings.

Paper ID: 27
Title: Determination of Optimum WEDM Parameters for Maximum Material Removal Rate when Arc Cutting SKD11 Tool Steel
Abstract:
This paper presents a study on determining optimum Wire Electrical Discharge Machining (WEDM) parameters when arc processing SKD11 steel to get the maximum Material Removal Rate (MRR). In this work, seven input parameters including the pulse on time, the pulse off time, the cutting voltage, the serve voltage, the cutting speed, the wire feed, and the arc radius were inspected. The influence of these parameters on the MRR of WEDM process was studied. Besides, optimum input parameters were suggested for getting the maximum MRR. It was also reported that the optimum input parameters were suitable to apply.

Paper ID: 28
Title: Effect of WEDM Parameters on Surface Roughness when cutting SKD11 Steel
Abstract:
This paper introduces a study on determination of optimal process parameters when Wire Electrical Discharge Machining (WEDM) when processing circular arcs SKD11 steel. In this study, several input parameters counting the pulse on time, the pulse off time, the cutting voltage, the serve voltage, the wire feed, the cutting speed, and the arc radius were considered. The effects of these parameters on the workpiece surface roughness were learned. In addition, optimal process parameters for getting the minimum surface finish were found. It was noted that the optimum experimental model was proper for applying.

Paper ID: 29
Title: Influence of Input Parameters on MRS in EDM SKD11 Steel
Abstract:
In this paper, the results of studying the influence of input parameters on the material removal speed (MRS) when electrical discharge machining (EDM) cylindrical shaped parts made from SKD11 steel have been introduced. To solve that problem, the Taguchi method was used to design the experiment and analyze the results. Besides, the input process parameters including the pulse time, the pulse off time, the current and the serve voltage were investigated. The influence of the input parameters on MRS was evaluated by Analysis of Variance (ANOVA). Furthermore, a set of optimal input parameters has been proposed to achieve the maximum MRS.

Paper ID: 32
Title: Optimization of Machining Parameters for Improving Accuracy of Dimension and Shape of Bent Part in Rotary Draw Bending
Abstract:
This study dealt with the rotary draw bending method most used for tube bending and investigates how applied bending such as normal bending, using mandrels or pressing with booster have an effect on machining accuracy, focusing on dimensional defects due to springback and flat deformation to the transverse plane. The study used particle swarm optimization (PSO) algorithms to investigate the optimal machining conditions for improving the accuracy of dimension and shape of a bent part. The following findings were obtained: The springback during applied machining using a mandrel, or using a mandrel and booster together, is almost the same as during normal processing; The flattening near the center of the bend in applied processing using a mandrel, or a mandrel and booster together, decreases more than with normal processing at mandrel protrusion $L \geq 4$ mm, and the maximum can be suppressed to approximately 0.15%; When the sum of the springback and the flattening is taken as the objective function and the minimum value is obtained, the optimal solution is around $L = 7$ mm.

Paper ID: 33
Title: Effect of Frictional Conditions in Deep Drawing on Formability
Abstract:
This study investigated the stress and strain behavior caused in the forming process via simulation analysis using the finite element method, for suppressing punch shoulder and head plate thickness reduction die shoulder stress concentration by controlling the friction conditions. The following findings were obtained: The thickness of the blank head and punch shoulder decreased with the forming process. Due to the increase in the coefficient of friction with the punch side, the plate thickness reduction ratio decreases, and is the lowest when it is close to non-lubrication; Stress concentration occurs at the die shoulder with forming processing. With the increase in the friction coefficient value, forming limit parameter (FLP) increases slightly, but as it does not reach the limit value of 1, the forming process can be safely performed without mechanical damage; When the formability is comprehensively evaluated using the plate thickness reduction ratio and FLP, the friction coefficient $\mu = 0.4$ to 0.5 is reasonable.

Paper ID: 34
Title: Structural Design for Improving the Strength of Flat Wooden Pallets
Abstract:
The purpose of this study is to develop a new pallet structure using the inexpensive hinoki wood, which is produced in the Ehime Prefecture, having the same strength as the conventional Oregon pine wood. A new pallet structure was proposed for achieving high-strength by improving the flexural stiffness and compressive stiffness and achieving high-cost performance by using the inexpensive hinoki wood. The results obtained in this study are summarized as follows: deflection of the new type is reduced compared to the standard type, due to the increased bending rigidity of the edge board and deck board; compressive displacement of the new model decreases, as the compressive stiffness of the pallet legs increases; new mold pattern 6 made is higher in strength and rigidity than the standard mold; cost of the new type #6 is 72% of that of the standard type pallet, and cost can be reduced by 28%.