Welcome Messages

Dear colleagues,

It is our great pleasure and privilege to welcome you to the virtual edition of ICAMEM2022, the 2022 11th International Conference on Advanced Materials and Engineering. The conference will be held from March 30, 2022 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 with the theme "Advanced Materials and Engineering Materials". ICAMEM2022 aims at sharing new ideas and new technologies amongst the professionals, industrialists and students from research areas of Advanced Materials and Nanotechnology to share their recent innovations and applications and indulge in interactive discussions and technical sessions at the event..

Submitted papers will be peer reviewed by conference committees, the accepted papers that presented at the conference will be included into ICAMEM2022 conference proceedings, and be published with "Key Engineering Materials.

We would like to thank and welcome everyone, and hope you will enjoy ICAMEM2022.

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Content

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 Thailand Time

Instructions about Oral Presentation

- Materials Provided by the Presenters: PowerPoint or PDF files
- Duration of each Presentation: Regular Oral Session: About 8 Minutes of Presentation and 2 Minutes of Q&A.

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Time Schedule (Thailand Time, GMT+7)

March 30th

7:55-8:00	**Opening Speech**
8:00-10:00	**Keynote Session** **Chair: Prof. Katsuyuki Kida**
8:00-8:30	**Relation between residual magnetic field and cyclic stress loading** Prof. Katsuyuki Kida | University of Toyama, Japan
8:30-9:00	Prof. Elias C. Aifantis| NUniversity of Minnesota, Twin Cities
9:00-9:30	**Longitudinal bow estimation of U-shape Profile in cold roll formed commercial aluminum alloy** Prof. Dong-Won Jung | Jeju National University, South Korea
9:30-10:00	**Thermomechanical Reactions and Thermodynamics of Reversibility in Shape Memory Alloys** Prof. Dr. Osman Adiguze l Firat University, Elazig, Turkey
10:00-10:05	**Break**
10:55-12:10	**Session 1** **Chair: Prof. Hiroaki Onoda**
7	**Effects of Material Parameters of Crystal Plasticity on Mechanical Behavior based on the Crystal Plasticity Finite Element Method incorporating Non-crystalline Shear Band mechanism** Wanjia Li| Kyushu University, Japan
8	**Li-doped SnO2 electron transport layer for high-performance perovskite solar cell fabricated using magnetic field-assisted electrodeposition** Demas Aji | Mahidol University, Thailand
9	**Application of magnetic abrasive finishing process using alternating magnetic field for finishing polychlorotrifluoroethylene resin** Huijun Xie | Utsunomiya University, Japan
21	**Printability and Warpage Evaluation of Polypropylene/Nano Precipitated Calcium Carbonate Composite Prepared by Extrusion-based 3D Printing** Marlo Joseph Comadre | Department of Science and Technology, Industrial Technology Development Institute, Material Science Division
AM1112	**Numerical simulation of CNC incremental forming of straight wall parts based on model partition and non-steep surface** Dong W. Jung | Jeju National University, South Korea
M203	**Enhanced Virtual Impedance for Power Sharing Control in AC Microgrid** Emile Niringiyimana | North China Electric Power University, China
23	**Preparation of Novel Copper Iron Lazulite Imitated Phosphate Pigments** Hiroaki Onoda | Kyoto Prefectural University, Japan
12:10-13:30	**Session 2** **Chair: Prof. Masaru Aniya**
AM1110	**Optical Dielectric Constant and Electronegativity Difference in ANB8-N Type Binary Compounds** Masaru Aniya | Kumamoto University, Japan
AM1123	**Observation of Mode I and Mode II Fatigue Crack Growth on Silicon Nitride Balls under Cyclic Compressive Loads** S. Matsubayashi| University of Toyama, Japan
AM1126	**Retained Austenite Reduction near Fracture Surface in Repeatedly Quenched SUJ2 Steel** Koshiro Mizobe| University of Toyama, Japan
28	**Research on high-temperature constitutive relationship of aluminum alloy** Chen Wenning | Jeju National University, South Korea
29	**Study on flow stress model of AA5005 material** Li Sijia | Jeju National University, South Korea
12	**The degradation of the most common stainless steels: real case issues** Christian Paglia | Supsi University of Applied Sciences of Southern Switzerland
18	**Graphical abacus of the thermal doses felt by the radiation emitted from a Bleve fireball, realized on the basis of the analytical model of Hasegawa and sato** Anas Mbarki | MOHAMMED V UNIVERSITY IN RABAT
30	**Single Point Incremental Forming as a Cost-Effective Sheet Forming Process for Small Batch Production** Kosimov Nodibek | Jeju National University

Keynote Speakers

Prof. Katsuyuki Kida

University of Toyama, Japan

Professor Katsuyuki Kida was born in 1968 in Osaka, where he studied mechanical engineering at Osaka University from 1988. 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 obtained a Ph.D. 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 several materials used in machine elements. He has also continued fundamental research on contact problems, for which he received 'The Best Paper Prize (FFEMS PRIZE)' from 'Fatigue & Fracture of Engineering Materials & Structures' journal in 2005. The awarded papers reported establishing a crack growth mechanism under contact pressure, a problem previously unsolved for over 70 years since S. Way's proposed theory. 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 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 bearings 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)." As a chairperson of department of mechanical engineering in University of Toyama, Professor Kida is heading education and research projects (2019-)..

Prof. Elias C. Aifantis

University of Minnesota, Twin Cities

Elias C. Aifantis is currently an Emeritus Professor of Mechanics at Aristotle University of Thessaloniki/Greece and Michigan Technological University/USA, as well as Mercator fellow at Friedrich-Alexander University/Germany and a Distinguished Professor at Beijing University of Civil Engineering and Architecture/China. Formerly, he has also been a Distinguished Faculty Advisor at King Abdulaziz University/Saudi Arabia, Distinguished Visiting Expert at ITMO University/Russia and Southwest Jiaotong University/China, as well as MegaGrant Director at Togliatti State University /Russia. He has promoted highly interdisciplinary work in mechanics of materials by bringing into the field of solid mechanics ideas from diffusion theory, chemical reactions, and nonlinear physics. He has coined the terms dislocation patterning, material instabilities, gradient plasticity/elasticity, chemo/nanomechanics, and pioneered internal length gradient (ILG) theories in these fields. Currently, he is extending the ILG framework to revisit electromagnetism and Maxwell's equations, as well as gravitation and Newton's Law. He has published over 350 articles and received about 13,402 citations with 59 h-index (Scopus); 12,450 citations with 55 h-index (Web of Science); 20,580 citations with 70 h-index (Google Scholar). He is included in the ISI Web of knowledge list of the world's most highly cited authors in engineering (2019).

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.

Prof. Dr. Osman Adiguzel

Firat University, Elazig, Turkey

Dr. Osman Adiguzel graduated from Department of Physics, Ankara University, Turkey in 1974 and received PhD- degree from Dicle University, Diyarbakir-Turkey. Dr. Adiguzel served his directorate of Graduate School of Natural and Applied Sciences, Firat University in 1999-2004. He supervised 5 PhD- theses and 3 M. Sc theses. He is also Technical committee member of many conferences. He received a certificate which is being awarded to him and his experimental group in recognition of significant contribution of 2 patterns to the Powder Diffraction File – Release 2000. The ICDD (International Centre for Diffraction Data) also appreciates cooperation of his group and interest in Powder Diffraction File. He published over 60 papers in international and national journals; He joined over 120 conferences and symposia in international and national level as Plenary Speaker, Keynote Speaker, Invited speaker, speaker or Poster presenter. He served the program chair or conference chair/co-chair in some of these activities. In particular, he joined in last even years (2014 - 2020) over 80 conferences as Speaker, Keynote Speaker and Conference Co-Chair organized by different companies in different countries. Additionally, he retired at the end of November 2019, and contributed with Keynote/Plenary. Scientific fields: Shape memory effect and displacive phase transformations in shape memory alloys and other alloys, molecular dynamics simulations, alloy modeling, electron microscopy, electron diffraction, x-ray diffraction and crystallography.

Session 1

Paper ID: 7
Title: Effects of Material Parameters of Crystal Plasticity on Mechanical Behavior based on the Crystal Plasticity Finite Element Method incorporating Non-crystalline Shear Band mechanism
Abstract:
The crystal plasticity finite element method (CPFEM) has emerged as an important method to study the materials on a mesoscopic scale. However, a significant obstacle for the application of CPFEM is the numerous material parameters associated with it. Therefore, a physics-based CPFEM incorporating the mechanism of non-crystalline shear band formation is selected in this study as it can stimulate both work-hardening and strain-softening mechanisms. A three-dimensional smooth specimen model was established to simulate the tensile test. The effects of six fitting crystal plasticity material parameters on the yielding stress, work-hardening behavior, and strain localization behavior are. In addition, the influencing mechanisms are discussed.

Paper ID: 8
Title: Li-doped SnO2 electron transport layer for high-performance perovskite solar cell fabricated using magnetic field-assisted electrodeposition
Abstract:
One of the key challenges for the development of perovskite solar cells lies in the approach toward large-scale fabrication of the active materials that allows for good photovoltaic performance, as well as facile handling. The electrodeposition technique can potentially address such requirements. However, the technique has yet to be investigated in detail and still suffers from low efficiency of the device. In this study, we sought to significantly upgrade the electrodeposition approach by coupling the technique with an external magnetic field in the preparation of high-quality PbI2 precursor layer and using Li-doped SnO2 electron transport layer. Our results showed that the magnetic field-assisted electrodeposition yielded good crystallinity of PbI2 and perovskite. Introducing the Li-doped mesoporous SnO2 into the device structure resulted in a higher current density of 18.50–18.80 mA cm-2, which can be attributed to, based on the linear sweep voltammetry, reduced resistance of the electron transport layer from 32.27 to 22.11 Ω cm-2. Moreover, the carbon-based device prepared using this simple procedure also yielded 5.20% in photoconversion efficiency for 1-cm2 active area and 0.45% for 25-cm2 active area, all without any significant hysteresis.

Paper ID: 9
Title: Application of magnetic abrasive finishing process using alternating magnetic field for finishing polychlorotrifluoroethylene resin
Abstract:
In previous studies, it has been verified that the magnetic abrasive finishing process using alternating magnetic field can achieve higher finishing efficiency and surface quality, and nano-level finishing of 5052 aluminum alloy material and SUS304 stainless steel material has been realized. In this study, the feasibility for ultra-precision finishing of polychlorotrifluoroethylene resin by this process was investigated, and the cutting mechanism of particles was discussed. As a result, the cutting depth of the particles is mainly affected by the size of the magnetic particles and abrasive particles. According to the experimental results, under optimized experimental conditions, the surface roughness of the workpiece can be improved from 112.83 nm Ra to 5 nm Ra within 15 minutes.

Paper ID: 21
Title: Printability and Warpage Evaluation of Polypropylene/Nano Precipitated Calcium Carbonate Composite Prepared by Extrusion-based 3D Printing
Abstract:
Polypropylene (PP) is a promising material for extrusion-based additive manufacturing due to its low cost, chemical resistance, good mechanical properties, versatile, and can be applied in various industrial applications. Recent research has focused on addressing the warpage issue in 3D printing of PP filaments. The effect of environmental conditions and loading of nano precipitated calcium carbonate (NPCC) in the pristine polypropylene to decrease warpage using the Fused Deposition Modelling (FDM) printing technology was studied. PP-NPCC composite filaments containing 5, 10, and 15 NPCC (wt%) were prepared using the twin-screw extruder. The printability, physicochemical, and mechanical properties of the PP-NPCC blends were determined. Based on the results, the incorporation of NPCC has contributed to the improvement of 3D printability and warpage in the PP-NPCC composite. At controlled environmental conditions, the filament was printable and the warpage was decreased by 44% at 10% NPCC loading. At the same concentration, there was a 30% increase in compressive strength and 43% increase in elastic modulus of the 3D printed parts.

Paper ID: AM1112
Title: Numerical simulation of CNC incremental forming of straight wall parts based on model partition and non-steep surface
Abstract:
In order to realize the CNC incremental forming of the straight wall parts, a CNC incremental forming method with the sheet metal posture adjustment in multiple directions based on the model partition and the non-steep surface was proposed in this paper. With the help of the non-steep surface, the sheet metal posture is adjusted to reduce the forming angle of the straight wall; to ensure the straight wall to be formed without breaking. The results of numerical simulation shows that the method proposed in this paper can form the straight wall parts that cannot be formed by the traditional multi-pass incremental forming, and the straight wall parts of the formed parts have better contour accuracy, uniform thickness distribution and applicability.

Paper ID: M203
Title: Enhanced Virtual Impedance for Power Sharing Control in AC Microgrid
Abstract:
The conventional droop control is the most applicable control method for power sharing in MGs mainly due to its operating features with no communication requirements. However, it suffers largely from inaccurate reactive power sharing caused by the discrepancy in the line impedance. This paper proposes an enhanced virtual impedance method for power sharing control to overcome the weakness of the conventional droop control method in an autonomous low voltage AC Microgrid (MG). This method is based on the voltage compensation strategy across different feeder impedances amongst parallel inverters in the distributed generation (DG) sources by the adaptive virtual impedance. The Virtue impedance is enhanced by compensating the line voltage drop which is calculated based on the reactive power error and the voltage drop difference between the line impedances. The MATLAB/Simulink simulation results show that the proposed method is feasible and more effective than the conventional droop control technique.

Paper ID: 23
Title: Preparation of Novel Copper Iron Lazulite Imitated Phosphate Pigments
Abstract:
In recent years, the use of hazardous heavy metals has been banned all over the world, and the development of alternative materials is required. As for inorganic pigments, heavy metals have been used so far, but there is an urgent need for development of inorganic pigments that do not use these. In this work, novel phosphate pigments imitated natural ore were prepared from copper, iron, aluminum nitrate solutions, ascorbic acid, and phosphoric acid at pH 5. The obtained precipitates were heated at 300 and 500ºC for 1 hour. The precipitates and their thermal products were estimated with X-ray diffraction (XRD), Infrared (IR) spectra, ultraviolet–visible (UV–Vis.) reflectance spectra, and L*a*b* color space. By adjusting the Cu/Fe ratio and temperature, inorganic phosphate pigments of light blue, green, yellow, orange, brown and red could be obtained.

Session 2

Paper ID: AM1110
Title: Optical Dielectric Constant and Electronegativity Difference in ANB8-N Type Binary Compounds
Abstract:
An empirical relation that correlates the optical dielectric constant and the electronegativity difference in ANB8-N type binary compounds is presented. The relation uses only one numerical constant common to all I-VII, II-VI and III-V compounds. The simplicity of the relation provides a clue to understand the role of the charge transfer from one atom to another in the origin of the optical dielectric constant. It is also shown that the optical dielectric constant correlates better with the Pauling ionicity scale than with the Phillips ionicity scale. The possible physical background of the found relation is discussed based on the results obtained.

Paper ID: AM1123
Title: Observation of Mode I and Mode II Fatigue Crack Growth on Silicon Nitride Balls under Cyclic Compressive Loads
Abstract:
Mode I and Mode II fatigue crack growth on the equator of silicon nitride balls were tested under cyclic compressive loads. The mode I crack propagated in a straight direction along compressive axis. The angle of the mode II crack changed toward the direction perpendicular to tensile stress direction. The effect of mode I on cracks in differential mode II was strong after cycles.

Paper ID: AM1126
Title: Retained Austenite Reduction near Fracture Surface in Repeatedly Quenched SUJ2 Steel
Abstract:
High-carbon high-strength JIS-SUJ2 bearing steel is an alloy having the characteristics of high wear resistance and fatigue strength as a result of quenching. When this kind of high-strength material is exposed to long-lasting low stress application loadings, fisheye fractures can often be seen. In this research, we measured the retained austenite near the fracture surface in JIS-SUJ2. After the measurement, we confirmed the decrease of the retained austenite in the vertical surface under both fisheye fracture and ductile fracture.

Paper ID: 28
Title: Research on high-temperature constitutive relationship of aluminum alloy
Abstract:
On the worldwide tendency of wight reduction of automobile, aluminum is drawing a large number of researcher's sights because it's advantages of low weight, corrosion resistance, flexible and so on. Aimed at understanding high-temperature flow behavior of aluminum alloy A5005, tensile tests were conducted at temperatures 360℃, 430℃, 500℃ and strain rates 0.0003s-1, 0.003s-1, 0.03s-1 respectively. For constitutive equation molding, a simplified Johnson-Cook model was adopted to describe high-temperature relationship of A5005 alloy. One of superiorities of this model is the flow stress model can be established more efficiently. What's more, adiabatic temperature rise is eliminated by introducing development trend of material stress and strain in this model. Finally, the root mean square error (RMSE) was used to check the accuracy of the final model. The results show that the model accuracy increase by temperature increasing and strain rate decreasing, and the simplified Johnson-Cook model can describe stress-strain tendency without losing much accuracy.

Paper ID: 29
Title: Study on flow stress model of AA5005 material
Abstract:

Due to the continuous emergence of new alloys and the improvement of basic research requirements for aluminum alloy, researchers need to further study the flow constitutive relationship of new aluminum alloys. This paper used Model MTS-810 tensile machine to conduct tensile tests on AA5005 aluminum alloy at temperature of 360℃ and strain rate of 3×10^(-2) s^(-1). Hollomon model, Swift model, Voce model, Voce+Voce model were used to compare the fitting accuracy with the experimental stress-strain curves, and the fitting parameters required by each formula were obtained from the fitting results, so as to obtain the constitutive model of AA5005 aluminum alloy. The Voce+Voce model which with more fitting freedom degree, lower flow stress increasing rate and saturation rate is most suitable to describe flow stress relation of aluminum alloy AA5005.

Paper ID:12
Title: The degradation of the most common stainless steels: real case issues
Abstract:
Stainless steel may be susceptible to localized corrosion. Despite this fact, still too many infrastructures are planned with an inadeguate metal chemical composition or placed in wrong environments. In most cases, a clear underestimation of these factors affects the stainless steel durability. These unexpected issues cause a significant technical and economical impact. In this work, several case studies of Inox exposed to unfavorable environmental conditions are presented. A wide range of structures, such as house handles, a swimming pool, a parapet, an industry plant and a waste water collection tank are investigated with respect to the corrosion behavior. Temperature and humidity cyclic variation, promote the enrichments of aggressive agents and lead to degradation. A too low Molybdenum content of the steels is inadequate for some type of structures and service conditions. The weldability changes depending on the steel type and along the thermally affected zones, intergranular corrosion may appear. In addition, a galvanic contact of the stainless steel with existing low alloyed steels components promotes the deterioration of the latter.

Paper ID: 18
Title: Graphical abacus of the thermal doses felt by the radiation emitted from a Bleve fireball, realized on the basis of the analytical model of Hasegawa and sato
Abstract:
The effects due to the thermal radiation of the fireball produced during a Bleve explosion are devastating on people (burns and death), on infrastructures and buildings (degradation and damage). The analytical simulation of these effects has for objective the delimitation of the zones of effects and the location of the safety distances. However, this methodology raises difficulties, since the realization of a hazard study requires a certain uncommon mastery and expertise. The authors propose a new graphical method that allows to efficiently determine the hazard zones of the effects of thermal doses, and consequently, the delimitation of the safety distances in case of an accident Bleve. The method is based on the conversion of analytical formulas of radiation flux intensity and dose into parametric functions, where the parameter of this general formula is specified only as the thermal damage dose experienced by the radiation. This allowed us to draw a graphical chart containing 10 characteristic functions, and the radius of the fireball. The adequate utilization of this method can improve the response time of first responders in disaster areas to set up safety zones and evacuate people, and at the same time improve the safety of a large number of facilities

Paper ID: 30
Title: Single Point Incremental Forming as a Cost-Effective Sheet Forming Process for Small Batch Production
Abstract:

Recently, developing flexible and economical sheet forming processes and technologies is very important. Incremental forming is one of the promising sheet forming processes and it can be valid for these purposes. Especially, single-point incremental forming (SPIF) becomes popular because of its low expenses and rapidly adaption to customers' needs. In this study, first a brief overview of SPIF will be given and then, outcome of implementing this sheet forming process with minimum costs will be presented. During the study, tool path for forming process is generated using free student version of CAD/CAM software package and low-cost CNC machine used to forming sheet workpiece. Aluminum AA3003 is used as material and combination of oil with grease used as a lubrication for experiments. The result indicated that SPIF is cost-effective process for small batch and prototype production