

Indo-Europe Joint Conference

Proceedings of the

Second International Conference on Advancements in Materials Science and Technology – iCAM 2022



Venue:
*Sathyabama Institute
of Science and
Technology, India.*

November 2-4, 2022

Jointly Organized by



Editors

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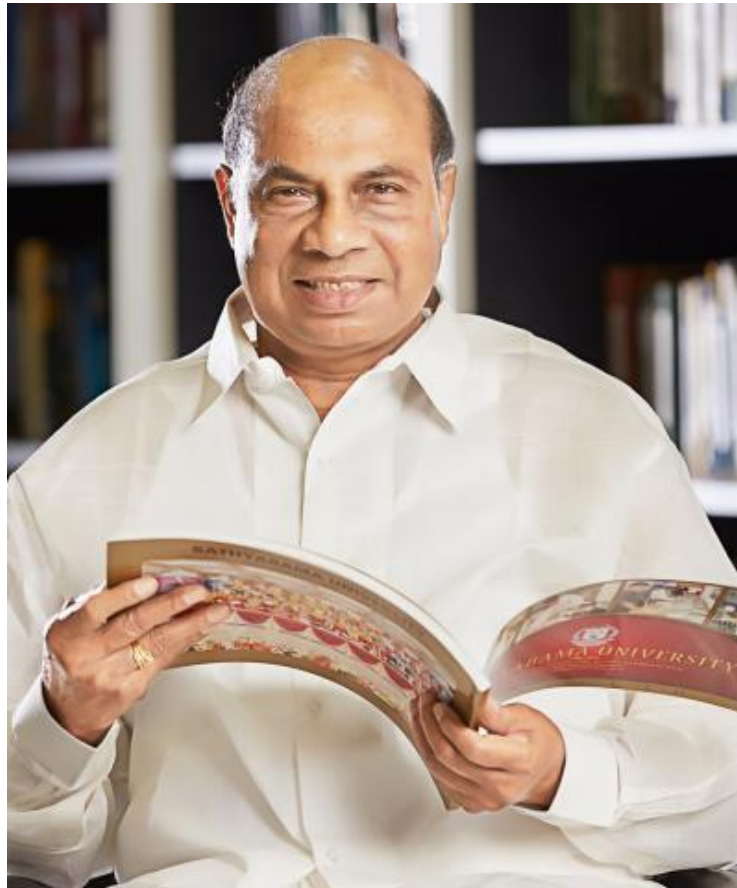
India – Europe Joint Event

Second International Conference on
Advancements in Materials Science and Technology
(iCAM 2022)



November 02 – 04, 2022

FOUNDER CHANCELLOR'S VISION



Sathyabama Institute of Science and Technology was established with the goal of providing everyone with access to high quality higher education. Sathyabama Institute was founded on the principles of upholding moral principles, maintaining order, and developing technical talent for the benefit of our society. The goal was to bring the Institution to the fore front in the national and international arena. As a pioneering higher education Institute in the country, Sathyabama has always been an Institution par excellence in contributing to the social and economic development of the nation. Col. Dr. Jeppiaar's vision was that Institute should remain as a true role model to provide opportunity for everybody to succeed both in professional and personal life.

CHANCELLOR'S DESK



MESSAGE

I am delighted to learn that the Centre for Nanoscience and Nanotechnology, Centre of Excellence for Energy Research, Sathyabama Institute of Science and Technology is jointly organizing a Second International Conference on “Advancements in Materials Science and Technology” (iCAM-2022), during 02-04, November 2022 in association with Centre for Functional and Surface-Functionalized Glasses, Alexander Dubček University of Trenčín, Slovakia. I am delighted to welcome you all to the iCAM-2022. The purpose of this International conference is to promote research in Materials Science & Technology and focusing research more on ENERGY, GLASS CERAMICS, SURFACE ENGINEERING, FUNCTIONAL MATERIALS, SENSORS, PROCESS and MECHANICAL BEHAVIOR and its applications. I am confident that this conference will offer a special chance for students, young researchers, academicians, and entrepreneurs to participate and learn about developments in the field of materials science and technology. I congratulate the Conference organisers and scientists from Centre for Nanoscience and Nanotechnology and Center of Excellence for Energy Research, for their hard work in organizing this Conference. I wish this conference a great success.

Dr. MARIAZEENA JOHNSON

Chancellor

Sathyabama Institute of Science and Technology, Chennai – 600119, India.

PRESIDENT'S DESK



MESSAGE

I am glad to note that Centre for Nanoscience and Nanotechnology, Centre of Excellence for Energy Research, Sathyabama Institute of Science and Technology is jointly organizing a Second International Conference on “Advancements in Materials Science and Technology” (iCAM-2022), during 02-04, November 2022, In association with Centre for Functional and Surface-Functionalized Glasses, Alexander Dubček University of Trenčín, Slovakia. It is my pleasure to welcome all of you to the iCAM 2022. In the 21st century, nanostructured materials have become a key role in various aspects of science and technology. iCAM2022 highlights the importance of sustainable materials design, development and performance of several systems associated with nanoscience and technology.

I am grateful and express my sincere gratitude to all committee members of the iCAM 2022 for their constant support and hard work that have been envisaged in bringing out good quality research findings from delegates across the globe. In addition, my sincere thanks to eminent speakers from the various parts of globe for spending their valuable time to share their knowledge with the delegates of iCAM 2022. I congratulate the organizers and scientists from Centre for Nanoscience and Nanotechnology, Centre of Excellence for Energy Research on their constant effort and wish the conference a grand success.

Dr. MARIE JOHNSON

President

Sathyabama Institute of Science and Technology, Chennai – 600119, India.

VICE CHANCELLOR'S DESK



MESSAGE

I welcome all delegates to the Second International Conference on “Advancements in Materials Science and Technology” (iCAM-2022), jointly organized by Centre for Nanoscience and Nanotechnology, Centre of Excellence for Energy Research, Sathyabama Institute of Science and Technology & Centre for Functional and Surface-Functionalized Glasses, Alexander Dubček University of Trenčín, Slovakia during November 02-04, 2022. It is my pleasure to welcome all of you to the iCAM 2022. The iCAM 2022 has the potential to develop a platform for the transformation of research plans and execution of experiments to produce products and start-ups in the most challenging fields of Materials Science and Technology. The scope of the conference theme is quite wide and involves ENERGY, GLASS CERAMICS, SURFACE ENGINEERING, FUNCTIONAL MATERIALS, SENSORS, PROCESS and MECHANICAL BEHAVIOR and their applications. In addition to that emphasis is focused on different approaches and huddles in basic research in the field of Solar Photovoltaics & Solar Thermal, Batteries & Supercapacitors, Photocatalysis & Electrocatalysis, Solid Oxide Fuel Cells, Thermoelectric, Biofuels, Transparent Glass-Ceramics, Glass-ceramic Compositions, Applications of Glass-ceramics, Dental Glass-Ceramics, Bioactive glass-ceramics, Glass Crystallization, Coatings and Thin Films, Corrosion and Erosion, Thermal Barrier Coatings, Optical Coatings, Laser Texturing, Laser Modification, Chemo Sensors, Biosensors, Gas Sensors, Electrochemical Sensors, Wearable Sensors, Piezo Sensors, Crystal Growth, Nanocomposites, Carbon-Carbon Composites, Shape Memory Alloys, Magnetic Materials, Biomaterials, Ceramics and Polymers, Photo/Electrochromic, Metal, Alloys and Superalloys, Welding and Joining, Additive Manufacturing/3D printing, Tribology of Materials, Coatings Tribology, Bio- and Tribo-Corrosion, Bio tribology, Nanomechanical Properties, Implants and Coatings e.t.c, I am very confident that this iCAM 2022 would contribute to the evolution of inter-disciplinary and inter-institutional programmes by exchanging innovative ideas and knowledge. I wish all attendees of the Conference iCAM 2022 to have successful discussions. I wish this Conference a grand success.

Dr. T. SASIPRABA

Vice Chancellor

Sathyabama Institute of Science and Technology, Chennai – 600119, India.

ABOUT THE CONFERENCE (*i*CAM 2022)

The 2nd International Conference on ADVANCEMENTS IN MATERIALS SCIENCE & TECHNOLOGY (*i*CAM-2022) is held during 02–04, November 2022. The objective of the conference is to highlight the current research in the thrust areas of materials science and technology. The *i*CAM-2022 is dedicated to bringing up substantial discussions on major sectors of advanced materials processing, characterization techniques, modeling & simulation, material properties, performance and device fabrication in the field of ENERGY, GLASS CERAMICS, SURFACE ENGINEERING, FUNCTIONAL MATERIALS, SENSORS, PROCESS and MECHANICAL BEHAVIOR. This conference shall be a platform and opportunity to learn and share the latest research experience, insights of the research scholars, faculty, scientists and industry professionals and also to offer solutions to the issues in the field of materials science. This Conference also focus on the core thematic areas such as, Solar Photovoltaics & Solar Thermal, Batteries & Supercapacitors, Photocatalysis & Electrocatalysis, Solid Oxide Fuel Cells, Thermoelectric, Biofuels, Transparent glass-ceramics, Glass-ceramic compositions, Applications of glass-ceramics, Dental glass-ceramics, Bioactive glass-ceramics, Glass crystallization, Coatings and Thin Films, Corrosion and Erosion, Thermal Barrier Coatings, Optical Coatings, Laser Texturing, Laser Modification, Chemo sensors, Biosensors, Gas Sensors, Electrochemical Sensors, Wearable Sensors, Piezo Sensors, Crystal Growth, Nanocomposites, Carbon-Carbon Composites, Shape Memory Alloys, Magnetic Materials, Biomaterials, Ceramics and Polymers, Photo/Electrochromic, Metal, Alloys and Superalloys, Welding and Joining, Additive Manufacturing/3D printing, Tribology of Materials, Coatings Tribology, Bio- and Tribo-Corrosion, Bio tribology, Nanomechanical Properties, Implants and Coatings e.t.c, This Conference includes keynote lectures from eminent scientists across the globe, special talks from various companies in advanced instrumentations and their applications at atomic scale and oral presentations by scientists /academicians/scholars/ students on various aspects in Materials Science and Technology. The *i*CAM 2022 Conference helps in bridging the gap between academia and industries for overall societal development. The selected full-length articles will be published in peer-reviewed Journals such as *Materials Today: Proceedings*, *Special Issue on Coatings: Ceramic Materials and Coatings- Materials to Applications* and *Special Issue on Ceramic Coatings for High Temperature Applications* published by Multidisciplinary Digital Publishing Institute (MDPI).

ABOUT SATHYABAMA, INDIA

Sathyabama Institute of Science and Technology (Deemed to be University), a pioneer University in engineering, science and technology education for more than three successful decades. Sathyabama offers multi-disciplinary academic programmes in various fields of Engineering, Science, Technology, Law, Dental Science, Pharmacy, Nursing, Management, Arts and Allied Health Sciences. The Institute has established world class research centres with several advanced facilities and equipments to carry out research and development in several frontier areas such as nanoscience and nanotechnology, energy, molecular and nanomedicine, climate change, waste management, remote sensing, etc. The Ministry of Human Resource Development (MHRD), Government of India has declared it as Category 'A' University. The National Institutional Ranking Framework (NIRF), has ranked the University in the Top 50 Universities, consecutively for the past six years which has placed the institute in the elite category in India. Sathyabama has received the maximum five-star ratings for teaching, inclusiveness and facilities and four-star ratings for employability and innovation. The Institute has been awarded the highest Diamond Rating by QS - iGAUGE, a rating for Indian Universities by QS. The Institute has a team of dynamic and outstanding faculties, with innovative pedagogical practices and state-of-the-art research facilities. Funded projects worth of Rs. 300 Crores from various Government and Private agencies and organizations have been sanctioned and many of them have been successfully completed. The institute has been granted 100+ patents and awaiting grant of patents for more than 500+ products and inventions and was ranked among the category Institutions in the country for Innovation by ARIIA Ranking. The Institute has launched the first successful student satellite "SATHYABAMASAT" designed and developed by faculty and students in association with Indian Space Research Organization (ISRO), Government of India. Sathyabama has been organizing National and International Conferences every year in broader areas of Engineering, Science and Technology, which serve as a platform for researchers all over the world, to share and enrich their knowledge. For more details, please visit: www.sathyabama.ac.in.

ABOUT CENTRE FOR NANOSCIENCE AND NANOTECHNOLOGY

The Centre for Nanoscience and Nanotechnology was established in January 2006 at the University campus to accomplish the goal of enhancing advanced research in the areas of Nanoscience and Nanotechnology. The leading area of research includes nanomaterials, nanotechnology, composite materials, nanoelectronics and nanofabrication. In addition to research, the centre also conducts training and awareness programme, workshops, national and international conferences on recent trends and developments on various themes of national interests. The Centre is undertaking research and development projects from various national/international funding agencies.

The centre has equipped with many core research facilities for coatings deposition including RF/DC magnetron sputtering, Pulsed Laser Deposition (PLD), E-Beam Evaporation and Thermal Evaporation; and characterization facilities such as High-resolution Transmission Electron Microscopy (HRTEM), Field Emission Scanning Electron Microscopy (FESEM), Atomic Force Microscopy (AFM), Raman Spectroscopy, Glancing Angle X-Ray Diffraction (GIXRD), Linear Reciprocating Tribometer (LRT), Stylus Profilometer, Electrochemical Impedance Spectroscopy (EIS), and Fluorescence spectroscopy etc. Through these cutting-edge research facilities, we are developing innovative technologies for the industrial and social benefits. Please visit: www.centrefornanotechnology.com

ABOUT THE CENTRE OF EXCELLENCE FOR ENERGY RESEARCH

The Centre of Excellence for Energy Research (CEER) funded by the **Ministry of Human Resource Development (MHRD)**, Govt. of India was inaugurated by His Excellency **Dr. A. P. J. ABDUL KALAM**, Former President of India on December 9th, 2014 in the august presence of **Col. Dr. JEPPIAAR**, Founder and Chancellor of the Sathyabama Institute of Science and Technology. This Centre was generously funded by MHRD, under the scheme of Centre of Excellence in the Frontier Areas of Science and Technology (FAST) for the establishment of “Centre of Excellence for Energy Research (CEER)” to promote research activities in the area of Solar Photovoltaics, Fuel Cells, Supercapacitors, Photocatalysis and Bio-energy etc.

The main objectives of this Centre of Excellence are to promote education, training, research and developmental programmes in the novel and newly emerging areas of energy research and to develop cost effective, efficient and sustainable technologies for the energy needs of the nation. The Centre also aims to enhance the quality and quantity of basic and applied research programs. The Centre organizes workshops/conferences for students, researchers, academic staff, and scientists in India to further strengthen their expertise in the areas of energy research, to accelerate the India’s human development index and to provide energy security.

The Centre is established in the International Research Centre (IRC) with facilities such as Raman Spectroscopy (Renishaw inVia Reflex Raman spectrometer), DEKTAK profilometer from (Bruker, USA), Potentiostat,- Galvanaostat with Impedance Analyser (Biologic, France), Hall Effect measurement system (Ecopia, South Korea), Raman Spectroscopy (Renishaw, United Kingdom), UV-Visible Spectroscopy (Jasco Analytical Instruments), 50L Biodiesel Pilot plant (Malnad Extraction Industries Bangalore, India), Gas chromatography (YL Instrument South Korea) and Advanced Photoreactor. The major research laboratories established are Photovoltaics, Surface Physics, Energy Materials, Materials Chemistry, Materials Processing and Bio fuels.

ABOUT FUNGLASS, Alexander Dubček University of Trenčín, Slovakia

CENTRE FOR FUNCTIONAL AND SURFACE-FUNCTIONALIZED GLASSES is the project supported by the 8th European Framework programme for Research and Innovation HORIZON 2020. It is based at Alexander Dubček University of Trenčín (Slovakia, coordinated by Prof. Dušan Galusek). Project partners include Friedrich-Alexander University Erlangen-Nürnberg (Germany, with Prof. A. Boccaccini), Friedrich Schiller University Jena (Germany, with Prof. L. Wondraczek), Spanish National Research Council (Spain, with Prof. A. Durán) and University of Padova (Italy, with E. Bernardo).

The scope of the project is the upgrade of existing Centre of excellence for ceramics, glass, and cement, to an internationally recognized Centre for functional and surface-functionalized glasses. The new centre will be specialized in cutting edge research in the area of glasses with special functional properties (luminescence, electric), and in the functionalization of conventional glasses with the aim of modification of their properties, and adding new functionalities. These would comprise reflection, and anti-reflection coatings for solar energy production and optoelectronic applications, increase of glass strength, enhancing the corrosion and leaching resistance of commercially produced glasses, self-cleaning/antibacterial coatings of glasses for medical applications, including modification/enhancement of bioactivity. The research topics would include also utilization of waste materials for production of glasses and glass-ceramic materials with high added value. The project will be aimed at establishment of the Centre as a joint venture of all participating institutions, creation and formalizing the coordination and management structures, upgrading the research infrastructure, expansion of personal capacity of the existing centre to the level facilitating achievement of the critical mass for R&D activities, with special attention paid to hiring high quality researchers and engineers from abroad, in order to create creative international environment, and formation of close ties with regional and European glass industries for efficient knowledge transfer.

PREFACE

I take immense pleasure in welcoming our patrons, chief guests, distinguished delegates, participants, scientists, research scholars and students for the Second International Conference on “Advancements in Materials Science and Technology” (iCAM-2022), jointly organized by Centre for Nanoscience and Nanotechnology, Centre of Excellence for Energy Research, Sathyabama Institute of Science and Technology & Centre for Functional and Surface-Functionalized Glasses, Alexander Dubček University of Trenčín (Slovakia) during 02-04, November 2022.

The *iCAM-2022* includes basic & advanced research in the fields of Solar Photovoltaics & Solar Thermal, Batteries & Supercapacitors, Photocatalysis & Electrocatalysis, Solid Oxide Fuel Cells, Thermoelectric, Biofuels, Transparent glass-ceramics, Glass-ceramic compositions, Applications of glass-ceramics, Dental glass-ceramics, Bioactive glass-ceramics, Glass crystallization, Coatings and Thin Films, Corrosion and Erosion, Thermal Barrier Coatings, Optical Coatings, Laser Texturing, Laser Modification, Chemo sensors, Biosensors, Gas Sensors, Electrochemical Sensors, Wearable Sensors, Piezo Sensors, Crystal Growth, Nanocomposites, Carbon-Carbon Composites, Shape Memory Alloys, Magnetic Materials, Biomaterials, Ceramics and Polymers, Photo/Electrochromic, Metal, Alloys and Superalloys, Welding and Joining, Additive Manufacturing/3D printing, Tribology of Materials, Coatings Tribology, Bio- and Tribo-Corrosion, Bio tribology, Nanomechanical Properties, Implants and Coatings e.t.c.. I think that this conference provides a forum for young professionals to network with established academics and business leaders and opens the door for them to stay with current developments in the field of materials science and technology.

I also express my deepest gratefulness to the Management, Sathyabama Institute of Science and Technology and our beloved Founder Chancellor Late Col. Dr. JEPPIAAR and our Chancellor Dr. Mariazeena Johnson, President Dr. Marie Johnson and Vice Presidents for providing us great opportunity to conduct the *iCAM 2022*. I salute the advisory committee members, conveners, and organising team members from different institutions who have worked incredibly hard to connect the delegates all around the entire globe.

On behalf of Sathyabama Institute of Science and Technology I thank all the academicians, experts, consultants, researchers, entrepreneurs and industrialists for having accepted our invitation to grace the conference.

Dr. T. SASIPRABA

Vice Chancellor & Organizing Secretary

Sathyabama Institute of Science and Technology, Chennai, India.

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Performance evolution in machining parameter of Al-Ai(LM6) alloy using neural network

S Arunkumar^{*a}, N.Sriraman^b, R.Muraliraja^a, T.Vinod Kumar^a and V. Muthuraman^a^a Department of Mechanical Engineering, Vels Institute of Science, Technology & Advanced Studies (VISTAS) Tamilnadu, India.^b School of Mechanical Engineering, SASTRA Deemed University, Tamilnadu, India.*Corresponding author: gct.arunkumar@gmail.com

ABSTRACT

In this experiment, the solution is obtained for the cutting machine setup parameters using CNC turning operation utilizing the theories of artificial neural network. The mapping between a group of input and output values can be learnt by using artificial neural network. Once a network is trained, output values can be identified for a given set of input values. All the inputs like cutting speed, feed, depth of cut and coolant fluid rate and their corresponding methodology output like surface finish are included in the program. This technique uses back propagation neural networks to accomplish forward mapping of method inputs and outputs. These networks can then be used interactively to update the foremost effective machine setup parameter. A program has been developed in MATLAB for resolution the model. The result from experiment is valid with neural network.

Keywords: LM6 Aluminium alloy, CNC Turning, Neural network, Optimization, Machining parameter.

PP-MB-479

A Brief Review on the reinforcements used in Aluminium Metal-Matrix-Composites

^aRehmth Bazil RM, ^aMadhavi Lata Vangara, ^aLokeswar Patnaik*^a School of Mechanical Engineering, Sathyabama Institute of Science and Technology (Deemed to be University), Chennai- 600 119, India* Corresponding author: lokeswar.nits@gmail.com

ABSTRACT

The prerequisite for low-cost materials with high performance caused the researchers worldwide to switch the focus from monolithic to composite materials. Recently, a remarkable attempt has been made in this direction to produce several combinations of metal matrix composites. Among the MMCs, aluminum-based composites are treated as the most promising structural materials due to their high corrosion, wear resistance, specific modulus, and weight for automobile and aerospace applications. Aluminum MMCs were produced by various fabrication process after considering different reinforcement particles, such as borides, carbides, oxides, nitrides, and their combinations. Aluminum MMCs revealed