

# Preface

The 9th Annual International Conference on Material Science and Engineering (ICMSE2021) was successfully held from July 22nd to 24th, 2021. Due to the COVID-19 situation and travel restrictions, ICMSE 2021 was converted into a virtual conference via Tencent Meeting.

The ICMSE2021 is becoming one of the leading international conferences for presenting novel and fundamental advances in material science and engineering in China. We believe that through keynote speeches by outstanding, internationally recognized scholars, oral sessions, and posters presentations, the conference has reflected an overview of the latest developments in materials science. The topics of ICMSE 2021 ensured an exchange of scientific information and opinions in a field with impressive dynamics, considering the research's technological progress and theoretical and practical aspects. This forum provided opportunities for the senior and young researchers and representatives to the academia and industry to exchange new ideas, establish research or business relations, and find partners for future collaboration. We hope that the conference has constituted a significant contribution to the knowledge in this up-to-date scientific field.

This proceeding tends to collect up-to-date, comprehensive, and worldwide state-of-art knowledge on material science and engineering. All the accepted papers were subjected to strict peer-reviewing by 2-3 expert referees. The papers have been selected for this proceedings based on originality, significance, and clarity for the purpose of the conference. The selected papers and additional late-breaking contributions made an exciting technical program at the conference. The conference program was extremely rich, featuring invited keynote speeches, panel discussions, high-impact oral and poster presentations. The keynote speaker was an internationally recognized leading expert in material science and engineering, who has demonstrated outstanding proficiency and has achieved distinction in their profession. We hope this conference not only provided the participants a broad overview of the latest research results on material science and engineering, but also provided the participants a significant platform to build academic connections.

We would like to express our sincere gratitude to all the members of the Technical Program Committee and our keynote speakers for their enthusiasm, time, and expertise. Our deep thanks also go to many volunteers and staff for the long hours and hard work they have generously given to ICMSE 2021.

Finally, we would like to thank all the authors, speakers, and participants of this conference for their contributions to ICMSE 2021, and we also look forward to welcoming you to the ICMSE 2022.

# ICMSE 2021 Committee

## Chair

Prof. Ke Wang, East China University of Technology (ECUT), China

## Editor

Prof. Ke Wang, East China University of Technology (ECUT), China

Prof. Fadi HAGE CHEHADE, Lebanese University, Lebanon

## Keynote Speaker

Prof. Mark J. Jackson, Kansas State University, USA

Prof. Xizhong An, Institute of Particle Technology, Northeastern University, China

Prof. Shuanghong Wu, University of Electronic Science and Technology of China, China

Prof. Norhayati Zakuan, International Business School, UTM, Malaysia

Prof. Guohua Xie, Wuhan University, China

## Chair of TPC

Prof. Fadi HAGE CHEHADE, Lebanese University, Lebanon

## Technical Program Committee

Dr. Timur Sh Atabaev, Nazarbayev University, Kazakhstan

Prof. Mi Lu, Texas A&M University, U. S. A

Dr. Adnen ARBI, University of Carthage, Tunisia

Dr. Tomasz Trzecieński, Rzeszow University of Technology, Rzeszow, Poland

Prof. Romuald Rzadkowski, Institute of Fluid Flow Machinery, Gdańsk, Poland

Dr. Sajid Hameed, petroleum processes engineering college, tikrit university, Iraq

Dr. Saleh Mobayen, University of Zanjan, Zanjan, Iran

Dr. Ali Fadhil Naser, Al-Dulaimi Al- Furat Al-Awsat Technical University, Iraq

Dr. Mădălina Dumitriu, University Politehnica of Bucharest, Romanian

Prof. Faheem Uddin, DIHE/ KU, Karachi, Pakistan

Prof. M. G. H. Zaidi, G.B. Pant University of Agriculture & Technology, Pant Nagar, India

Dr. G.ELATHARASAN, Department of Mechanical Engineering, Anna University, Pattukkottai, India

Prof. Ho-Sung Lee, University of Science and Technology, Daejeon, Korea

Prof. Nasr-Eddine CHAKRI, Badji-Mokhtar University. Annaba, Sidi Amar, Algeria

Dr. Md. Shafiul Ferdous, Khulna University of Engineering & Technology, Bangladesh

Dr. Jeng Shiang-Cheng, Taipei City University of Science and Technology, Taiwan

Dr. Mohamed Issam ZIANE, Higher School of Electrical and Energetic Engineering, Algeria

Prof. Liviu Popa-Simil, Los Alamos Academy of Sciences, USA

Dr. Ștefan Țălu, The Technical University of Cluj-Napoca, Romanian

Dr. Davoud Beiknejad, Azad University, Gorgan Branch, Gorgan, Iran

Dr. Mahtab Gholami, Alzahra University, Tehran, Iran

Dr. Agnieszka Woszek, Lublin University of Technology, Lublin, Poland

Dr. Parthiban Kathirvel, School of Civil Engineering, India

Dr. Muhammad Akram, Government College University Faisalabad, Pakistan  
Dr. Gholamreza Khalaj, School of Materials Science and Engineering, Islamic Azad University, Markazi, Iran  
Prof. Zhenzhou Cheng, Tianjin University, Tianjin, China  
Prof. Wen-Ta Su, National Taipei University of Technology, Taiwan  
Dr. Salah Salman, Al-Azhar University, Egypt  
Prof. Ju-Nan Kuo, National Formosa University, Taiwan  
Dr. Sheikh Ahmad Izaddin b. Sheikh Mohd Ghazali, Universiti Teknologi MARA, Malaysia  
Prof. Hui-Ming Wee, Chung Yuan Christian University, Malaysia  
Prof. Fadi HAGE CHEHADE, Lebanese University, Lebanon  
Dr. Guohua Xie, Wuhan University, Wuhan, China  
Dr. Krzysztof Kuś, University of Warmia and Mazury in Olsztyn, Poland  
Prof. Yo-Sheng Lin, National Chi Nan University, Taiwan  
Dr. Sheng-Fu Yang, Institute of Nuclear Energy Research Atomic Energy Council, R.O.C., Taiwan  
Prof. Zhang Ning, Beijing Union University, Beijing, China  
Dr. Wen-Cheng Lai, National Taiwan University of Science and Technology  
Prof. Daohai Zhang, Guizhou Minzu University, Guizhou, China  
Prof. Sanboh Lee, National Tsing Hua University, Taiwan  
Prof. Jih-Mirn Jehng, National Chung Hsing University, Taiwan  
Dr. Krzysztof Kuś, University of Warmia and Mazury in Olsztyn, Poland  
Dr. Jian WANG, Shanghai Radio Equipment Research Institute, Shanghai, China  
Dr. MEOR MUHAMMAD HAFIZ SHAH BUDDIN, Universiti Teknologi MARA, Malaysia  
Dr. Elammaran Jayamani, Swinburne University of Technology Sarawak Campus, Malaysia  
Dr. Dorota Anna Krawczyk, Bialystok University of Technology, Poland  
Dr. Nariman Khalil, The University of Balamand, Lebanon  
Prof. Li-Jiang Zeng, Zunyi Normal College, China  
Dr. Haluk Çağlar KAYMAK, Atatürk University, TURKEY  
Dr. Y-Chuang Chen, Minghsin University of Science & Technology, Taiwan  
Prof. Huolin Huang, Dalian University of Technology, China  
Dr. Zafar Said, University of Sharjah, United Arab Emirates  
Prof. Mark J. Jackson, Kansas State University, U. S. A  
Dr. Ahmed M. Eldeeb, Helwan University, Egypt  
Dr. Bing Wang, Fuzhou University, China  
Dr. Zhauyt Algazy, Almaty University of Power Engineering and Telecommunication, Kazakhstan  
Dr. Hao Yi , Chongqing University, China  
Dr. Fateh Mebarek-Oudina, Skikda University, Algeria  
Dr. Yian Song, Arizona State University, U. S. A  
Dr. Haimeng Huang, University of Electronic Science and Technology of China, China  
Dr. Chi-Wai Chow, National Chiao Tung University, China  
Dr. Tommy Tanu Wijaya, Guangxi Normal University, China  
Dr. GHULAM HASNAIN TARIQ, Khawaja Fareed University of Engineering & Information Technology, Pakistan  
Dr. Mahmoud Ebrahimi, University of Maragheh, Iran  
Prof. Li Ngee HO, Universiti Malaysia Perlis, Malaysia  
Dr. Rashid Ali Laghari, Harbin Institute of Technology, China  
Dr. Hock Jin QUAH, Universiti Sains Malaysia, Malaysia

Prof. R. Siddheswaran, Pachaiyappa's College, India  
Dr. Habil Corneliu Doroftei, Alexandru Ioan Cuza University of Iasi, Romania  
Dr. Mohamed M.S. Wahsh, National Research Centre, Egypt  
Dr. Hossein Bakhshi Khaniki, The University of Adelaide, Australia  
Prof. Andry Sedelnikov, Samara National Research University, Russia  
Dr. CIORTEA Elisabeta Mihaela, "1 Decembrie 1918" University of Alba Iulia, Romania  
Prof. Abdel Ghani AISSAOUI, University of Tahri Mohamed of Bechar, Algeria  
Dr. Qingping Ding, Iowa State University, U. S. A  
Prof. Salah H. R. Ali, Modern University of Technology and Information, Egypt  
Prof. R.Delshi Howsalya Devi, Karpaga Vinayaga College of Engineering & Technology, India  
Prof. Maria Giovanna Buonomenna, Ordine Regionale dei Chimici e dei Fisici della Campania (OCF) and MIUR, Italy  
Dr. Hojjat Toiserkani, Graduate University of Advanced Technology, Iran  
Dr. Akbar Hojjati-Najafabadi, Jiangxi University of Science and Technology, China  
Prof. Indrajit Mukhopadhyay, Pandit Deendayal Petroleum University, India  
Dr. Wasim M.K. Helal, Harbin Institute of Technology, China  
Dr. Alpay Tamer ERTURK, Kocaeli University, Turkey  
Dr. M. Mubarak Ali, Chikkaiah Naicker College, India  
Dr. Daniela LITAN, Hyperion University, Romania  
Dr. Baba Imoro Musah, Wuhan University of Technology, China  
Dr. Malek Hassanpour, Osmania University, India  
Dr. Ahmad Hussain, Nanjing University of Science and Technology, China  
Prof. DAN DOBROTA, Lucian Blaga University of Sibiu Romania, Romania  
Prof. Chi-Hua Chen, Fuzhou University, China  
Dr. Phongsak Phakamach, Rajamangala University of Technology Rattanakosin, Thailand  
Dr. Subbaiah Rammohan Chitra, Anna University, India