

## Preface

The International Congress on Advanced Materials Science and Engineering (AMSE-2019) covered the diverse topics of fields and many professors, company executives, researchers and young scientists came to Osaka this July for this material scientific event.

At first glance, the conference topics in AMSE are so diverse that experts may wonder or hesitate if they could get any new information on their own fields by participating in the conference. Scientific interactions are complex and it is difficult to expect immediate results and new discoveries, which should be aimed at in a very specialized research conference. On the contrary, the AMSE conference and other similar conferences will be beneficial very much in the sense that one can ask elementary and basic questions, current status of applications in unfamiliar intermediate regions of research, where it is often difficult to bring questions out for researcher outside of their expertise. The AMSE and similar conferences could have valuable ideas in terms of applicability and applications for technical matter talking with very comfortable atmosphere of such a conference; even researchers may find different or new ways of theoretical understandings of their own special field. Hence, advantages of the conference depend on views and perspectives in their own specialty, and as personal opinions, interesting ideas, applications and projects essential for improving human societies and ecological systems have been obtained.

The information of scientific theories and technologies is useful for mankind; knowledge first set people free from fears and disasters from living in a severe natural environment; however, as fire gave people freedom and destructions simultaneously, mass consumption and production by human societies created massive wastes and environmental problems. Although fossil fuels, atomic energy and technologies promised a bright future, environmental and human health issues, extinction of species have seriously damaged our ecological systems, which may not be resolved in the near future. In order to solve problems of energy and accompanying wastes, scientists need to cooperate and test theories and technologies from all fields of sciences. It may not be easy to find optimal technologies, chemical and biological approaches appropriate for resolving environmental and ecological problems, and nobody could say definitely whether or not we can nail down true causes to resolve problems. A possibility to solve problems for ecological systems on Earth may come from interactions of all sciences, and hence, conferences for mutually beneficial interactions with comfortable atmosphere to ask questions freely would be helpful to all expertise of sciences. May sciences be successful for building peaceful ecological societies on the Earth.

*Hiroshi Uechi, Honorary Chairman of AMSE-2019*

Professor

Osaka Gakuin University, Japan

## **Special Issue based on the AMSE Conference held in Osaka, Japan 2019**

One of the main objectives of the AMSE Conference is to provide a forum for the discussion of a wide range of topics in modern material engineering research focusing on modelling, theory, experiments and applications. AMSE-2019 was held between the 22nd July and 24th July in the historic City of Osaka. It attracted more than 500 participants from 22 countries, with USA, China and Japan representing the three principal contributors to the program with Japan heading the list of papers presented at the meeting.

The topics covered in AMSE-2019 included Semiconductor and Superconductor Materials, Electronic and Optical Materials, Magnetic Materials, Information Materials, Artificial Intelligence, Nano Materials, Biomaterials and Bio-engineering, Soft tissue Mechanics, Polymer Materials, Composites Materials, Mechanical, and Manufacturing, 3D, 4D Printing Materials, Surface Science, Structural Materials, Carbon and Graphene, Environment and Green Materials. The program included more than 22 sessions 221 speakers gave informative presentations. 21 early career scientists delivered their talks at Young Scientists Forum, 5 more young authors contributed papers for this conference proceedings.

The Honorary Chairmen of the AMSE 2019 were Professor Masayoshi Tanaka of Kobe Tokiwa University, Professor Nigel Brandon of Imperial College London, Professor Hiroshi Uechi of Osaka Gakuin University, Dr. Yoshitake Masuda of AIST and the organizing committee consisted of ISTCI and FLC Event

AMSE 2019 invited six distinguished experts at Keynote Forum on the first day of the conference:

- **Dr. Nigel Brandon** of Imperial College, The University of London gave a presentation on *The Role of Electrode Microstructure in Fuel Cells and Batteries*
- **Dr. Raymond Oliver** of Northumbria University, Newcastle presented a lecture entitled *The Art and Application Space for Elastic Responsive Biopolymers and 3, 4 D Interactive Material Systems through Additive Soft Micro Fabrication*
- **Dr. Suong Van Hoa** of Concordia University, Canada and the Canada Center for Composites presented a lecture dealing with *4D Printing of Composites*
- **Dr. Alan Kin Tak Lau** of Swinburne University of Technology, Australia delivered a presentation on *Recent Development in Advanced Composite Materials Research*
- **Dr. Huijing Duan** of Peking University, China gave a presentation on *Irradiation Hardening and Embrittlement in Structural Materials*
- **Dr. A.P.S. Selvadurai** of McGill University, Canada presented a lecture on *Poro-Hyperelasticity: The Mechanics of Fluid-Saturated Soft Materials*

The present volume is a compilation of the papers presented at the AMSE 2019 and prepared from the final papers submitted by the authors. It is hoped that this initiative will lead to other successful international meetings that will form the venue for discussion of the recent advances in material science and engineering.

*A.P.S. Selvadurai FRSC, Keynote Speaker of AMSE-2019*

William Scott Professor and Distinguished James McGill Professor

Department of Civil Engineering and Applied Mechanics

McGill University, Canada

The International Congress on Advanced Materials Science and Engineering 2019 (AMSE-2019) was held at ANA Crowne Plaza Osaka from 22-24 July 2019. The congress was run under the auspices of ISTCI and operated by Four Leaf Clover Event.

The number of participants was over 500 who came from all over the world. The congress covered a wide range of subjects spanned from basic sciences to Engineering with a common philosophy, i.e., redefining the Future of Advanced Materials. A first major topic is associated with the current problems observed with future life change strongly focusing material R &D in our future life, while a second major topic is associated with the future advanced materials such as Semiconductor, Superconductor, Nano Material, AI (Artificial Intelligence), Medical Application, Environment and Energy, and so on.

This volume contains invited presentations and contributed papers. We would like to extend our appreciation to all the speakers and participants who presented stimulating talks and discussions. We would also like to express our sincere thanks to our sponsor and all of staff who helped the congress.

*Masayoshi Tanaka*, Honorary Chairman of AMSE-2019  
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