

## Preface

This volume contains some selected papers from the 2015 International Conference on Advanced Materials Engineering and Technology (ICAMET 2015) which is to be held in Kaohsiung, Taiwan during December 4-5, 2015, and is organized by Malaysian Research & Innovation Society (MyRIS) and Centre of Excellence Geopolymer & Green Technology (CEGeoGTech), Universiti Malaysia Perlis. The conference aims to provide a high level international forum for researchers, engineers and scientists to present their new advances and research results in the field of advanced materials engineering and technology.

This volume covered all the aspects of advanced materials engineering and technology, particularly of advanced characterization, biomaterials, biotechnology and life sciences, building materials, coating and surface engineering, composite and polymer materials, optical and photonic materials and any other related topics. All of the papers have been reviewed by more than two expert referees in their relevant topic disciplines. The paper selected for this volume depended on their quality and relevancy to the conference.

The editors hope that this volume will provide the reader a broad overview of the latest advances in the field of advanced materials engineering and technology, and that will be as valuable reference source for further research.

The editors would like to express their sincere appreciations and thanks to all the committee members of the ICAMET 2015 for their tremendous efforts. Without their dedication, it was impossible to have a successful ICAMET 2015 and a high quality volume of the conference proceedings. Thanks also to Trans Tech Publications for producing this volume. Finally, the editors would like to thank all the authors for their contribution to this valuable volume.

**Mohd Mustafa Al Bakri Abdullah**  
**Liyana Jamaludin**  
**Rafiza Abdul Razak**  
**Muhammad Faheem Mohd Tahir**

Universiti Malaysia Perlis, MALAYSIA

December, 2015

# Committees

## Co-organized by

World Invention Intellectual Property Association (WIIPA)

International Federation of Inventor's Association (IFIA)

Faculty of Materials Science and Engineering, Gheorge Asachi Technical University of Iasi, Romania

## International Advisory Board

Prof. Dato' Dr. Ahmad Mujahid Ahmad Zaidi (UPNM), Malaysia

Prof. Dr. Petrica Vizureanu, Gheorghe Asachi Technical University of Iasi, Romania

Prof. Dr. Mohammed Bnhussain, King Abdul Aziz City Science & Technology (KACST), Kingdom Saudi Arabia

Prof. Dr. Ion Sandu, Alexandru Ioan Cuza University of Iasi, Romania

Assoc. Prof. Dr. Andrei Victor Sandu, Gheorghe Asachi Technical University of Iasi, Romania

Associate Professor Dr. Kazuhiro Nogita, The University of Queensland, Australia

Prof. Dr. Ir. Djwantoro Hardjito, Petra Christian University, Indonesia

Prof. Ir. Iswandi Imran, MASc, PhD, Institut Teknologi Bandung (ITB), Indonesia

Prof. Dr. Safian Sharif (UTM), Malaysia

Prof. Drs. Subaer, MPhil, PhD, Universitas Negeri Makassar, Indonesia

Assoc. Prof Che Mohd Ruzaidi Ghazali, Universiti of Malaysia Perlis (UniMAP), Malaysia

# **Conference Organization**

## **Honorary – Chair**

Prof. Emeratus Dr. Kamarudin Hussin, Universiti Malaysia Perlis (UniMAP), Malaysia

## **Conference Chairman**

Associate Prof. Dr. Mohd Mustafa Al Bakri Abdullah, Universiti Malaysia Perlis (UniMAP), Malaysia

## **Technical and Organizing Committee**

Assoc. Prof. Dr. Aeslina Abdul Kadir, Universiti Tun Hussain Onn Malaysia (UTHM)

Dr. Hamzah Fansuri, Institut Teknologi Sepuluh Nopember (ITS) Indonesia

Dr. Gee Marie S. Binag, Philippines

Dr. Ir. Januarti Jaya Ekaputri, Institut Teknologi Sepuluh Nopember (ITS) Indonesia

Dr. Hamzah Fansuri, Institut Teknologi Sepuluh Nopember (ITS) Indonesia

Dr. Ervina Efzan Mhd Noor (MMU)

Dr. Mohd Remy Rozainy B. Mohd Arif Zainol (USM)

Dr. Norkhairunnisa Mazlan (UPM)

Dr. Muhamad Mat Nor (UMP)

Dr. Idawati Ismail (UNIMAS)

Dr. Rosdi Ibrahim (SIRIM)

Dr. Mohamad Nasir Mat Arip (FRIM)

Dr. Rafiza Ramli (Penchem Technologies Sdn. Bhd.)

## **Secretariat**

Dr. Rafiza Abdul Razak, Universiti of Malaysia Perlis (UniMAP)

Dr. Noorhafiza Mohamed, Universiti of Malaysia Perlis (UniMAP)

Engr. Liyana Jamaludin, Universiti of Malaysia Perlis (UniMAP)

Engr. Muhammad Faheem Mohd Tahir, Universiti of Malaysia Perlis (UniMAP)

Ng Hooi Jun, Universiti of Malaysia Perlis (UniMAP)

## **Reviewer List**

Assoc Prof Dr Andre Victor Sindhu, Gheorghe Asachi Technical University of Iasi, Romania

Assoc. Prof Dr. Supri Abd Ghani, Universiti Malaysia Perlis (UniMAP)

Dr Azlin Fazlina Osman, Universiti Malaysia Perlis (UniMAP)

Dr. Rosdi Ibrahim, SIRIM Berhad

Dr. Mohd Firdaus Omar, Universiti Malaysia Perlis (UniMAP)

Dr. Norsuria Mahmed, Universiti Malaysia Perlis (UniMAP)

Dr Heah Cheng Yong, Universiti Malaysia Perlis (UniMAP)

Dr Liew Yun Ming, Universiti Malaysia Perlis (UniMAP)

Dr Rizalafande Che Ismail, Universiti Malaysia Perlis (UniMAP)

Dr Wan Khairunizam Wan Ahmad, Universiti Malaysia Perlis (UniMAP)

Dr Irwana Nainggolan, Universiti Malaysia Perlis (UniMAP)

Dr. Rafiza Abdul Razak, Universiti Malaysia Perlis (UniMAP)

Dr. Zarina Yahya, Universiti Malaysia Perlis (UniMAP)

Dr. Azremi Abdullah Al Hadi, Universiti Malaysia Perlis (UniMAP)

Dr. Phak Len Al Eh Kan, Universiti Malaysia Perlis (UniMAP)

Dr. Mukhzeer Mohd Shahimin, Universiti Malaysia Perlis (UniMAP)

Dr. Nurul Izza MOhd Nor, Universiti Malaysia Perlis (UniMAP)

Dr. Rizalafendi Che Ismail, Universiti Malaysia Perlis (UniMAP)

Dr. Irnis Azura Zakarya, Universiti Malaysia Perlis (UniMAP)

Dr. Zarina Zakaria, Universiti Malaysia Perlis (UniMAP)

Dr. Norazian Mohamed Noor, Universiti Malaysia Perlis (UniMAP)

Dr. Noorhafiza Mohamed, Universiti Malaysia Perlis (UniMAP)

Dr. Shayfull Zamree Abd Rahim, Universiti Malaysia Perlis (UniMAP)

Dr. Mohd Saifuldin Abdul Manan, Universiti Malaysia Perlis (UniMAP)

Dr. Wan Khairunizam Wan Ahmad, Universiti Malaysia Perlis (UniMAP)

Dr. Du Ngoc Uy Lan, Universiti Malaysia Perlis (UniMAP)

Dr. Firuz Zainuddin, Universiti Malaysia Perlis (UniMAP)

Engr. Faizul Che Pa, Universiti Malaysia Perlis (UniMAP)

Engr. Liyana Jamaludin, Universiti Malaysia Perlis (UniMAP)