

Preface

The invention of the microscope has carved up a whole new dimension in science. By using microscopes, scientists are able to discover the existence of unique materials. Since their original invention, microscopes have moved beyond the simple visible light refracting lenses. Today in this ever challenging world, the application of electrons, x-rays, and infrared rays are utilised in far more sophisticated microscopes to detect even smaller and smaller structures. Their ability to diagnose the meticulous behaviours within the materials has significantly increased in order to stay competitive and serve essentially as a high technology medium in analysis aspects, especially in sustainable manufacturing and the life sciences. Innovation and creativity are two critical elements that give manufactures and scientist the leading edge. Sustainability, an emerging concern among manufacturers, recognizes the interdependency between the economy, social and the environment.

SCMSM is a reference conference associated with microscopy and microanalysis used in materials science, and various fields of engineering and chemistry. It is the place where the latest results in the various science and engineering areas are presented and discussed. SCMSM series of conferences is organized every year by the Microscopy Society Malaysia together with an educational institution. This year, the Faculty of Manufacturing, Universiti Teknikal Malaysia Melaka has been entrusted with the organization of SCMSM 24th.

It is hoped that this conference will serve as a good foundation and a starting point for exchange of ideas, knowledge and information between the researchers and professionals from academia, industries, government agencies and equipment manufacturer on issues pertaining to materials development and life sciences and its effect on current demand for global manufacturing sustainability and innovative in the biosciences.

FOREWORD BY THE DEPUTY MINISTER OF SCIENCE, TECHNOLOGY AND INNOVATION



Assalamualaikum wrt.wbt. and *Salam Sejahtera*,

The concept of nanotechnology was first discussed by the Nobel Laureate physicist, Richard Feynman's aspiration to take advantage of a new world available at the nanoscale level in which the scientist and technologist have the ability to manipulate and control individual atoms and molecules for the betterment of mankind. Thus, the advance in the microscopy has been progressing well over the years with the clear and focused approach to support this emerging technology of manufacturing and life sciences, including advanced materials, ultra-precision machine technology, stem cell research and genetic engineering.

Nanotechnology is an innovative and a converging field of knowledge which has been recognized as one of the catalyst of high growth for Malaysia to become a developed nation by the year 2020. The National Nanotechnology Initiative that was established in 2005 has managed to congregate local resources and knowledge amongst Malaysian researchers, industry and the Government to advance nanotechnology and the related sciences. This initiative has provided the platform for science and engineering researchers to converge together to create innovative, marketable products and services. In sustainable manufacturing, the manufacturers will need to embrace new level of thinking, technologies and best practices to face the new challenges ahead. In life sciences, evaluating its broader value to society is truly a daunting task because of the almost limitless potential it has to improve the lives and well-being of Malaysian and people around the globe.

I sincerely hope that the *24th Scientific Conference of the Microscopy Society Malaysia (SCMSM 2015)* would significantly contribute to the holistic implementation of the sustainable development, in particular the manufacturing sector and continuous innovation in life sciences. I believe the theme for this conference, "*Minute to Massive: Harnessing Microscopy for Sustainable Manufacturing and Innovative Life Science*" is timely and very much relevant to the transformation toward best practices of manufacturing processes and life sciences in which innovation of new technologies is always welcomed.

I would like to applaud the time and effort undertaken by the *SCMSM 2015* committee in organizing this meaningful event. It is my fervent hope that this conference will be able to contribute pertinent ideas to accelerate our national transformation agenda.

Thank you.

YB Datuk Dr. Abu Bakar Bin Mohamad Diah

Malaysian Deputy Minister of Science, Technology and Innovation

FOREWORD BY THE VICE CHANCELLOR



Assalamualaikum wrt.wbt. and *Salam Sejahtera*.

The *24th Scientific Conference of the Microscopy Society Malaysia (SCMSM 2015)*, has chosen the theme “*Minute to Massive: Harnessing Microscopy for Sustainable Manufacturing and Innovative Life Science*”, in appreciation of the enormous contribution of microscopy in both of these fields, where innovation of new technologies is encouraged to emphasize sustainable development. What you see, is what you get. The more one can observe, the more one can understand. The scientific investigation assisted by microscopy has unveiled the secrets of nature. Microscopic objects could be studied and the public is able to follow closely in the footsteps of scientists. With the advancement in microscopy, the world has become borderless and accessible, with bountiful knowledge that provides inspiration. Micrographs of cell division, nerves that make up the brain and single atoms have changed our views of the human body and nature itself. In the manufacturing sector, microscopy is significant in providing clues that assist our understanding of materials behavior in relations to their specific processing condition, for better control of the product performance at the actual service environment. Manufacturing, as the heartbeat of the economic growth and development, must become an increasingly high-added value, sustainable and competitive. Sustainable manufacturing is the creation of manufactured products that use processes that minimize negative environmental impact, and conserve energy and natural resources, that are safe for employees, communities, and consumers.

It is my hope that this conference will serve as a platform to stimulate discussions and exchange of ideas among local and international academicians, researchers, engineers, industries, government agencies and equipment manufacturers, who are actively involved in the field of microscopy, in harnessing it for sustainable manufacturing and innovative life science; it is also, transforming ideas and research findings into viable products by manipulating a “minute to massive” state of the art information enhanced from microscopy.

My heartiest congratulations to the Faculty of Manufacturing Engineering for its continuous efforts in organizing this conference. Last but not least, I hope all participants will have a fruitful knowledge – sharing experience, and do take this opportunity to visit some of our UNESCO historical sites in Melaka.

Thank you.

Professor Datuk Dr. Shahrin Bin Sahib @ Sahibuddin

Vice Chancellor, Universiti Teknikal Malaysia Melaka

FOREWORD BY THE PRESIDENT ELECT OF MICROSCOPY SOCIETY MALAYSIA (MSM)



Assalamualaikum wrt.wbt. and *Salam Sejahtera*,

The manufacturing sector plays a significant role in our economy which goes hand in hand with the tourism industry. Our economy is driven by knowledge-based economy, and hence, we rely heavily on the application of sciences and technologies in renewable and sustainable energy. These innovations and technologies are indispensable for our future economy and society as a whole. The emerging technologies are the current advances and innovation in various fields of manufacturing technology. The fields are inclusive but not limited on design, materials, system & processes, automation, and management (optimization). Moving towards sustainable manufacturing means to address sustainable issues and challenges in manufacturing sectors as well as to assist the transition from a fossil fuel dependence society to a sustainable society. Therefore, developing objective research based researches and policies within the sustainable manufacturing paradigm have become a significant task among R&D managers and policy makers.

Investment for technological innovation is an inevitable first step for future sustainable energy systems. To meet the goal of sustainable energy development, there is a growing pull of collaborative actions as well as researches to share best practices and adopt policies to facilitate this technology. The planner of the energy research has to grasp a broader coverage of scientific and technological research, and to make effective decisions to invest in promising and emerging technologies especially with the circumstances of limited resources.

The Scientific Conference of Microscopy Society Malaysia (SCMSM) is a national key annual event. It is my hope that this conference will serve as a state of the art platform to stimulate discussions and dissemination tangible exchange of ideas in the Emerging Technologies towards Sustainable Manufacturing especially in the various fields of manufacturing technology such as Nano technology and green technology. It may act as a catalyst in the manufacturing sector, particularly for companies in Malaysia, in embracing a sustainable and greener approach in manufacturing processes. My heartiest congratulations to UTeM for its continuous efforts in organizing this conference. Last but not least, I hope all participants will have a pleasant conference.

With kind regards, thank you and wassalam.

Associate Professor Captain Dr. Farid Che Ghazali
President-Elect Microscopy Society Malaysia

FOREWORD BY THE CHAIRPERSONS OF SCMSM 2015

Assalamualaikum wrt.wbt, and Salam Sejahtera,

We would like to express our heartfelt gratitude to all keynote speakers, invited speakers, paper presenters, sponsors, and participants for joining the *Scientific Conference of Microscopy Society Malaysia (SCMSM 2015)*. Your contributions in this conference are highly appreciated by Microscopy Society Malaysia (MSM) and Universiti Teknikal Malaysia Melaka (UTeM).

The SCMSM 2015 is jointly organized by UTeM and MSM with its theme “*Minute to Massive: Harnessing Microscopy for Sustainable Manufacturing and Innovative Life Science*” that provides a platform for researchers, academicians and industrial practitioners to share the current advances and innovations in both life and physical sciences in this ultra-fast revolving scientific world. Deeper understanding and vibrant exchange of ideas will propel Malaysia towards a competitive, highly advanced nation with wide applications from biology, agriculture to nano-scale engineering.

The SCMSM 2015 requires rigorous commitment from the organizing committee; hence, we would like express enormous acknowledgement and thanks to the staff from UTeM and the MSM committee in ensuring the success of this conference.

Towards scientific breakthroughs, and fruitful deliberations, SCMSM 2015!

Associate Professor Dr. Jariah Mohamad Juoi
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