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WEBINAR TALK ON

DIRECT HEATING METHOD: A NANOMATERIALS SYNTHESIS APPROACH BRIDGING R&D AND INDUSTRY?

SPEAKER:
Associate Professor Ts Ir Dr Pung Swee Yong

6 JUNE 2026, SATURDAY

10.00AM - 12.00PM

Registration Fees:
Student Members : Free
IEM Members : RM 15.00
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SYNOPSIS

The gap between laboratory-scale nanomaterials research and industrial implementation remains a major challenge often due to complex synthesis routes, high energy consumption, costly equipment, and limited scalability. This presentation introduces the Direct Heating (DH) Method as a simple, rapid, and energy-efficient nanomaterials synthesis approach that enables the transition from fundamental research to industrial application.

The DH method enables growth of metal oxide nanomaterials directly on substrates through controlled Joule heating, eliminating the need for vacuum systems, foreign catalysts, masking steps, or multi-stage processing. Operating at low electrical power and short synthesis times, the method significantly reduces fabrication complexity, energy consumption, and carbon footprint while maintaining high material quality and functional performance.

This talk will introduce the synthesis of various metal oxide nanomaterials including ZnO, TiO_2, MnO_2, CuO, and MgO using the DH method, highlighting nanomaterial products with controllable morphology, high surface coverage, and strong substrate adhesion. Key applications in environmental remediation, photocatalysis, and electronic device fabrication will be presented, demonstrating how DH-synthesised nanomaterials deliver competitive performance compared to conventionally produced counterparts.

The DH method aligns with sustainability goals, ESG principles, and Industry 4.0 initiatives will also be addressed, positioning DH method as a practical pathway to enable the adoption of nanomaterial research outcomes as the real-world industrial solution.

Key Takeaways:

1.Simple, rapid, and energy-efficient synthesis

Nanomaterials can be synthesised within minutes using low electrical power, significantly reducing energy consumption, processing steps, and carbon footprint.

2.Versatile platform for multiple nanomaterials and applications

A wide range of metal oxide nanomaterials (e.g. ZnO, TiO_2, MnO_2, CuO, MgO) can be produced with controlled morphology for applications in environmental remediation, photocatalysis, and electronic devices.

3.Sustainability-aligned technology

The DH method is compatible with existing manufacturing infrastructure and aligns with ESG, SDG, and Industry 4.0 objectives, enabling sustainable and scalable nanomaterials production.

4.Direct Heating bridges the lab - industry gap

The DH method offers a practical synthesis route that overcomes common barriers in nanomaterials translation, such as complex processing, high cost, and poor scalability.

SPEAKER'S BIODATA

Dr. Pung received his B.Eng. in Materials Engineering (First Class Honours) from Universiti Sains Malaysia (USM) in 1998. He began his career at S.E.H. (M) Sdn. Bhd., a silicon wafer manufacturing company, where he served as an R&D/ Materials Characterization Engineer. He later pursued his M.Tech. in Materials Science at the University of Malaya on a part-time basis and successfully completed the programme in 2002. In 2003, he joined InventQjaya (M) Sdn. Bhd., an R&D-based company, where he was responsible for the development of smart window technology based on polymer-stabilized cholesteric texture techniques. In 2006, he was awarded a scholarship under USM's Academic Staff Training Scheme (ASTS) to pursue doctoral studies. He obtained his PhD from the University of Nottingham, United Kingdom, in 2010, with a research focus on the synthesis and characterization of ZnO nanowires. Upon completion of his doctoral training, he then lectures in Universiti Sains Malaysia until now. His prior eight years of experience in the semiconductor industry becomes his valuable assets in lecturing, particularly for courses related to semiconductor.

Sustainable solution forms the core value of Dr. Pung's research from engineering of nanomaterials for sustainable manufacturing, environmental remediation, to clean energy technologies. One of his major contributions is the development of a novel Direct Heating (DH) synthesis method for nanomaterials including ZnO, MnO_2, TiO_2, CuO, MgO, and Co_2O_3. DH method is characterized by simple setup, low energy consumption, rapid process, and versatile scope of nanomaterials of diverse morphologies. Hence, it is a sustainable solution for the adoption of nanomaterial research outcomes into real industrial applications. His other research interests are photocatalytic removal of organic pollutants, heavy metals, and antimicrobial that address critical environmental and public health challenges.

Dr. Pung has established extensive international collaborations with researchers in the United Kingdom, Japan, Canada, Saudi Arabia, Vietnam, and Myanmar. To date, he has published more than 130 research papers, delivered presentations at international conferences, authored two book chapters and one monograph, and received four international and national innovation awards. He also serves as an editor of the Malaysian Journal of Microscopy (2022–2023). His research impact has been recognized globally, as evidenced by my inclusion in the Top 2% of Scientists Worldwide (Elsevier–Stanford) for both 2023 and 2024 in the fields of Materials, Applied Physics, and Enabling & Strategic Technologies.