

MONASH CENTRE FOR ELECTRON MICROSCOPY

Functional Material Solutions to Some Environmental Challenges

Date: Tuesday January 14, 2025

Time: 11:00 – 11.30am

Venue: S1, 16 Rainforest Walk, Clayton Campus

Abstract

Functional materials play a crucial role in addressing global challenges related to energy efficiency, land remediation, and agricultural productivity. These materials contribute significantly to sustainable energy solutions that mitigate environmental impacts. It has also been shown the application of functional materials in soil remediation efforts can restore contaminated lands, improve agricultural outputs and promote sustainable land use practices. In the sustainable energy front, organic-inorganic hybrid perovskites, particularly methylammonium lead iodide (MAPI), have emerged as promising materials for solution-processed electronics, including solar cells, LEDs, and FETs, though their long-term stability remains a significant challenge. I will share some of our work that employs complementary characterization techniques, such as low-dose in-situ electron microscopy and time-resolved photoluminescence, to elucidate the degradation mechanisms at MAPI grain boundaries and improve device performance. By combining three-dimensional perovskites with innovative low-dimensional capping layers, we demonstrate a strategy to enhance both photovoltaic efficiency and operational stability, paving the way for more effective applications in renewable energy technologies.

As the global population continues to rise, optimizing land resources for food production becomes increasingly critical, necessitating innovative solutions for soil conditioning and alternative growth media. This talk will present developments in super water absorbent microgel particles designed to enhance water retention and soil conditioning, along with alternative growth media for indoor farming and rooftop gardens, addressing challenges posed by climate change and extreme weather. I will attempt in this talk to give spectrum of examples ranging from polymers to inorganic materials to hybrid materials in the various applications. These are work that has been carried out in my group in recent years that aims to address some fundamental issues in understanding, design and application of these functional materials in environmental related applications.

Biography

Yeng Ming LAM (FRSC) received her Ph.D. degree in Materials Science and Metallurgy from the University of Cambridge, UK, in 2001. She is currently a Professor and holds the President Chair in Materials Science and Engineering in Nanyang Technological University, Singapore. Yeng Ming is also the Director of the Facility for Analysis, Characterization, Testing and Simulations (FACTS), a university facility for advanced characterization using electrons and X-ray since 2016. She has actively promoted and built advanced characterization infrastructure for in-depth understanding of materials. Her research aims to understand and design novel nanostructured functional nanomaterials for application in sustainable energy, sustainable food production and also environment remediation. She is also the Founder for FytoSol Pte Ltd that is dedicated to deliver solutions to horticulture and agriculture needs. She sits on the governing board for International Symposium for Polymer Analysis and Characterization (ISPAC), US, and the National committee on Measurement and characterization. She was awarded the Nanyang Award for Excellence in Teaching in 2006 and the inauguration L'Oréal UNESCO For Women in Science National Fellowship and the Nanyang Outstanding Young Alumni Award in 2009. In 2024, she was awarded the UL ASEAN-US Science Prize for Women (Senior Category, First Prize).

Convener: Professor Laure Bourgeois

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