澳門大學
UNIVERSIDADE DE MACAU
UNIVERSITY OF MACAU

應用物理及材料工程研究院
INSTITUTO DE FÍSICA APLICADA E ENGENHARIA DE MATERIAIS
INSTITUTE OF APPLIED PHYSICS AND MATERIALS ENGINEERING

IAPME Newsletter

https://iapme.um.edu.mo/

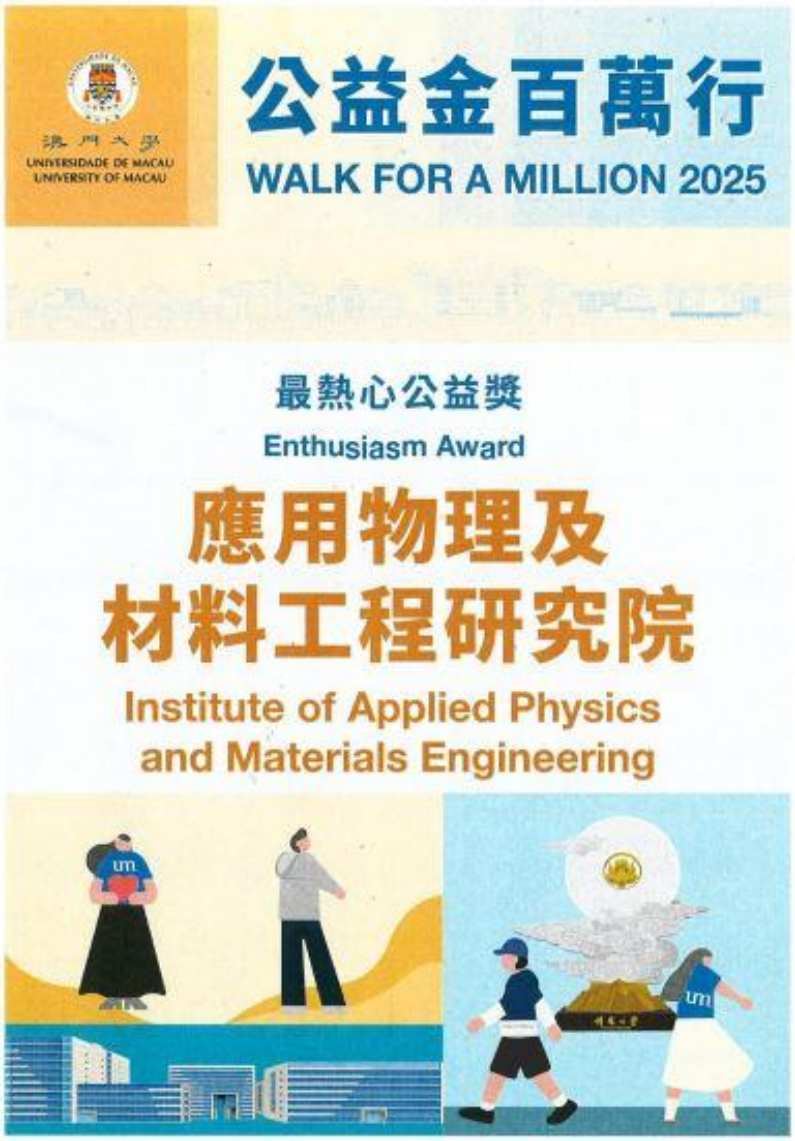
ISSUE 68

7 January 2026

✧ Content

❖ IAPME Recognized for Charity Efforts

Our Institute has been awarded the "*Enthusiasm Award – Participation in Charity Walk (Group)*" for the active involvement in the Walk for a Million 2025, a flagship fundraising event organized by the Charity Fund from the Readers of Macao Daily News.



The annual Walk for a Million aims to support social welfare initiatives across Macao, and our Institute has consistently demonstrated a strong commitment to this cause.

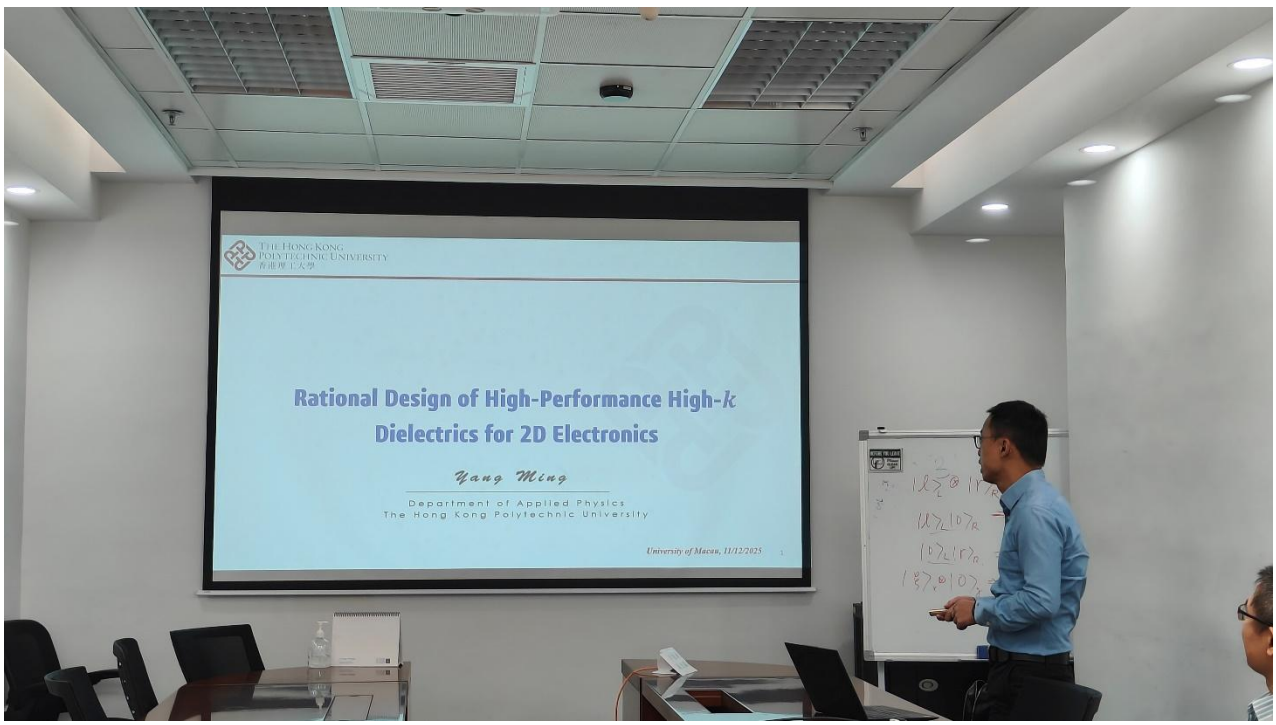
This year, we not only made generous contributions but also encouraged staff participation in the charity walk, reinforcing our dedication to community engagement beyond scientific research.

The award highlights our Institute's sustained efforts to integrate social responsibility into its institutional culture. We will continue to support charitable activities and contribute to Macau society through both research excellence and community service.

❖ Seminars

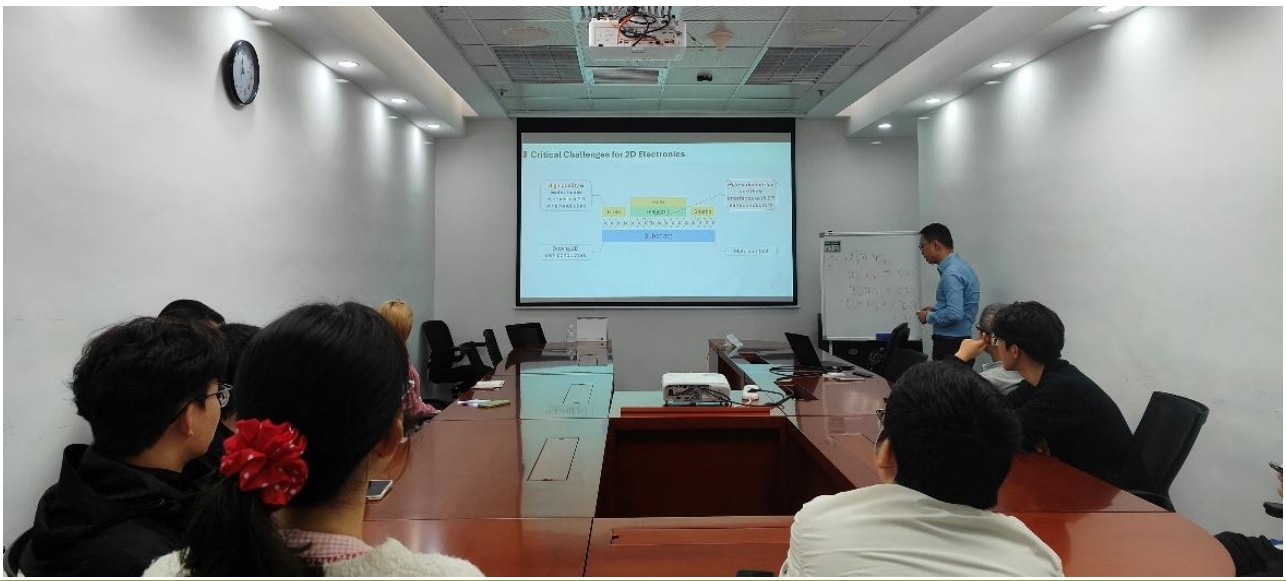
On December 11, 2025, our Institute welcomed Prof. Ming Yang (楊明), Assistant Professor in the Department of Applied Physics at the Hong Kong Polytechnic University, for an insightful seminar titled "*Rational Design of High-Performance High-k Dielectrics for 2D Electronics*". The event was hosted by Prof. Yongqing Cai, who extended the invitation to Prof. Yang.

Prof. Yang earned his bachelor's degree from Fujian Normal University (2001) and his Ph.D. from the National University of Singapore (2010). A prolific researcher, he has published over 200 peer-reviewed papers in leading journals such as *Science, Nature Materials, Nature Electronics, Nature Nanotechnology, Physical Review Letters, Advanced Materials, and Journal of the American Chemical Society (JACS)*. His recent work focuses on accelerating functional material development through high-throughput screening, large-scale density functional theory (DFT) calculations, and machine learning.



In his presentation, Prof. Yang shared recent progress in high-throughput screening of high-k dielectrics from extensive materials databases, addressing mechanisms that bridge theory–experiment gaps for nanoelectronics applications involving 2D materials. He emphasized the role of computational techniques in guiding experimental efforts toward next-generation electronic devices.

Prof. Yang expressed strong interest in collaborative research with our Institute, particularly in high-throughput design of new materials and first-principles studies of 2D systems, signaling promising opportunities for joint innovation in advanced materials science.



On December 12, 2025, our Institute hosted a seminar titled "*Exploring the 'Matterverse' with Data-driven Approaches for Clean Energy Applications*", presented by Prof. Bo Shen (沈淳) from the City University of Hong Kong and chaired by Prof. Qing Li.

Prof. Shen serves as a Presidential Assistant Professor in the Department of Materials Science and Engineering at CityU, specializing in accelerating the discovery of novel materials for clean energy technologies. He earned his Ph.D. from Brown University and completed postdoctoral training under Prof. Chad Mirkin and Prof. Chris Wolverton at Northwestern University. With over 30 SCI-indexed publications in leading journals such as *Nature Synthesis, Nature Communications, and JACS*, Prof. Shen brings extensive expertise to the field.

In his presentation, Prof. Shen addressed the core challenge of navigating the vast parameter space in polyelemental materials design. He outlined a systematic methodology that integrates solid-state synthesis, nanolithography, and computational simulations to generate large, high-quality datasets. These datasets are then used to train AI and machine learning algorithms, enabling predictive modeling of novel materials and accelerating exploration of the so-called "Matterverse."

Prof. Shen illustrated how this high-throughput, data-driven approach has uncovered design principles for unconventional nanomaterial architectures and identified promising candidates for clean energy applications, including liquid fuel electrooxidation and CO_2 electroreduction.

The seminar concluded with an interactive discussion, where participants explored the future potential of AI-driven materials discovery and its role in advancing sustainable energy solutions. The event underscored our Institute's commitment to fostering innovative strategies for clean energy research.

❖ Upcoming Events

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IAPME Seminar

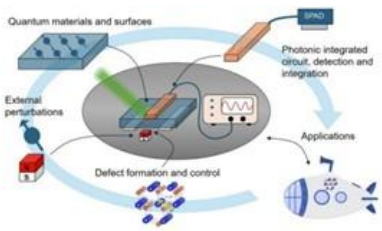
Quantum initiatives in Norway and discovery of polymorph heterostructures

9 January 2026

Prof. Andrej KUZNETSOV
University of Oslo
Venue: N23-4018
Time: 10:00 - 11:30
Hosted by: Prof. Shuang-Peng WANG

Abstract

Several initiatives have been recently launched in Norway aiming to strengthen the quantum technology research, even though the size of these initiatives remains relatively modest comparing with the programs running by the leading research nations. Nevertheless, building on our tradition in physics of defects in semiconductors, we organized a Centre for Defects in Semiconductors for Quantum Sensing, active 2025-2030. The vision is that the Centre becomes a hub for national and international cooperation on quantum technology in Norway. For example, there are efforts already resulted in collecting pioneering data on single photon emission in silicon together with EU partners, mastering Er:$LiNbO_3$ quantum memory platform with Korea, or recently commenced project to assist doctors at the Oslo hospital to block tumour cell invasion by more accurate mechanical forces measurements using quantum sensors. Another gain capitalized out of our tradition in physics of defects in semiconductors, is a discovery of disorder-induced ordering and unprecedentedly high radiation tolerance in Ga_2O_3 and related materials. Probably even more importantly, we showed that this process may be tuned towards self-assembling of atomically abrupt polymorph interfaces out of stochastic disorder in solid state. Notably, this work was also performed in a close international collaboration with partners in Europe, China, and Korea. Altogether, these data pave the way for enhancing functionalities in materials with not previously thought capabilities.



Biography

Prof. Andrej KUZNETSOV was awarded with a Ph.D. degree in physics from the Russian Academy of Sciences in 1992 and accomplished his habilitation in solid state electronics in 2000 at the Royal Institute of Technology in Sweden. In 2001 he joined the University of Oslo as an Associate Professor at the Department of Physics, where he was subsequently promoted to a Full Professor rank in 2003. From 2018 he acts as the Chair of the Centre of Excellence: Light and Electricity from Novel Semiconductors (LENS) as a part of the Centre for Mate rials Science and Nanotechnology at UiO. The focus is to understand novel semiconductors, searching for new fundamental phenomena and enabling new device functionalities.

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