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UNIVERSIDADE DE MACAU
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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

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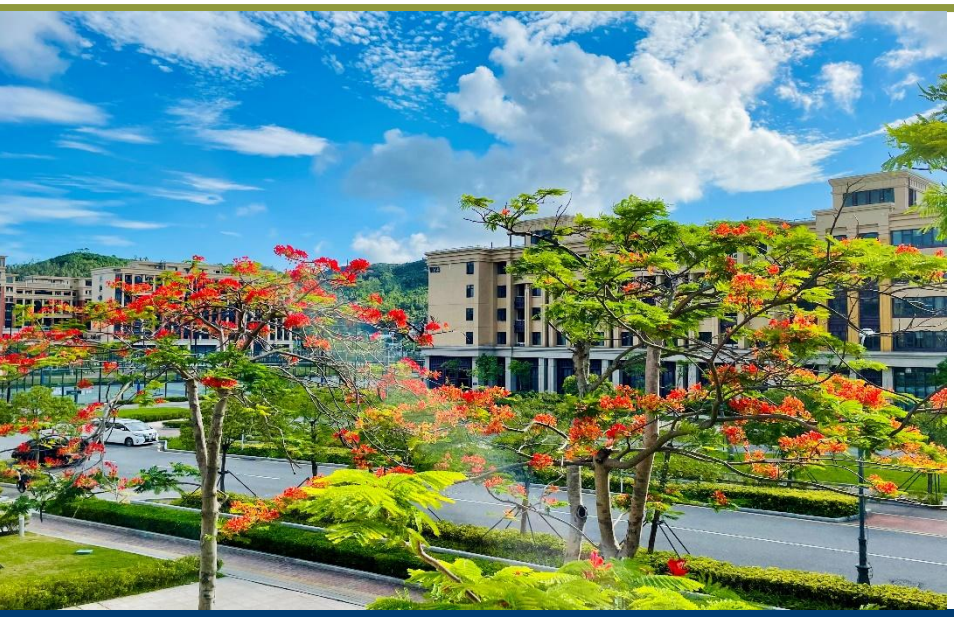

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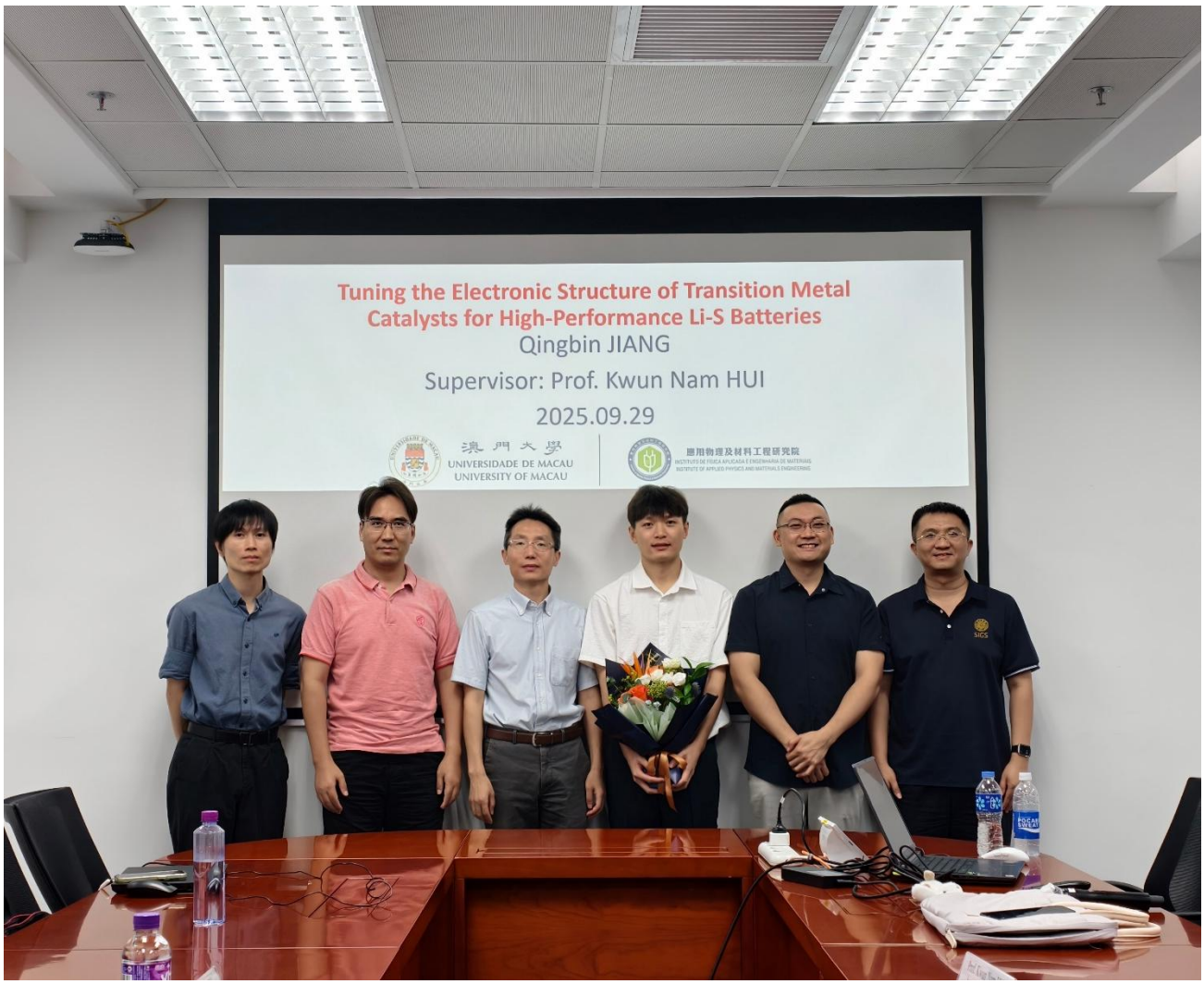
✧ Content

❖ Ph.D. Student Thesis Oral Defenses

Qingbin Jiang of Prof. Kwun Nam Hui's group presented "Tuning the Electronic Structure of Transition Metal Catalysts for High-Performance Li-S Batteries" in his oral defense on September 29, 2025.

Congratulations to Dr. Qingbin Jiang!

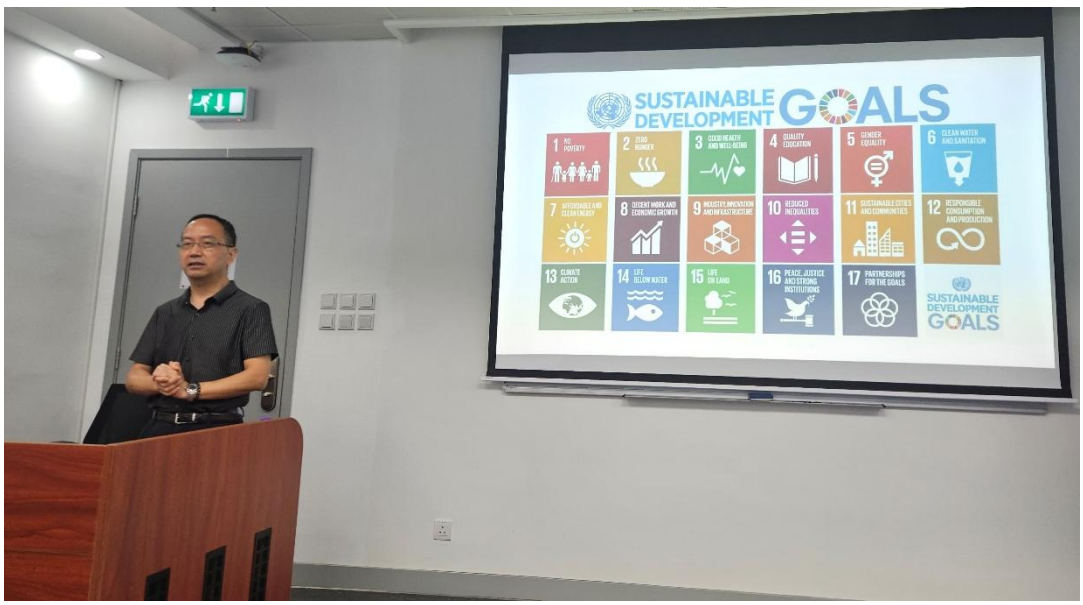


(from left) Prof. Bingpu Zhou (周冰朴), Prof. Huaiyu Shao (邵懷宇), Prof. Guichuan Xing (邢貴川), Dr. Qingbin Jiang (江慶斌), Prof. Kwun Nam Hui (許冠南) and Prof. Guangmin Zhou (周光敏, Tsinghua SIGS)

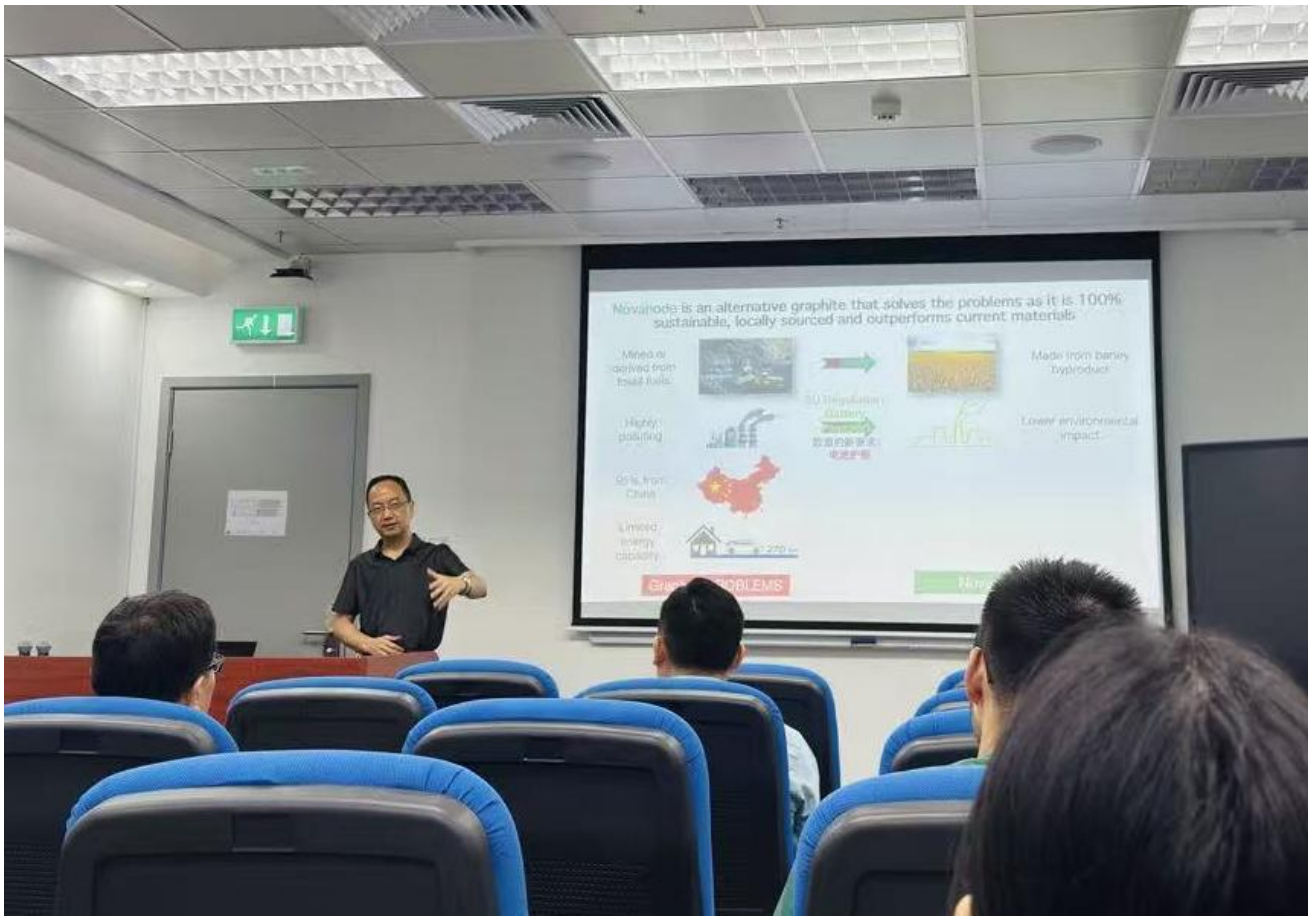
❖ Seminars

On September 26, 2025, Prof. Yimin Chao (巢毅敏) from Foshan Xianhu Laboratory visited our institute to deliver a seminar entitled "*Silicon-Enriched Biomass-Derived Hard Carbon for High-Capacity Lithium-ion Battery Anodes*". Prof. Chao is internationally recognized for his contributions to materials science and the nanosynthesis of silicon quantum dots (Si-QDs), and is a Fellow of the Royal Society of Chemistry (RSC). The seminar, organized by Prof. Kwun Nam Hui, drew an engaged audience of over 20 institute members and students.

Prof. Chao started his talk by addressing the environmental concerns surrounding graphite production in Europe, underscoring the urgent need for sustainable alternatives in energy storage technologies. He introduced his team's research on scalable, silicon-rich hard carbon derived from agricultural biowaste—specifically barley husks. The presentation detailed synthesis optimization strategies and the integration of Si-QDs ranging from 10 to 150 nanometers into the carbon matrix. The resulting composite anodes demonstrated exceptional electrochemical performance, achieving a specific capacity of 1382 mAh g^{-1} at C/5, significantly outperforming conventional graphite.



In the latter half of the seminar, Prof. Chao discussed the limitations of biomass-derived hard carbon when used independently and proposed a hybrid approach combining it with nano-silicon particles. A full cell configuration, utilizing NMC622 as the cathode, delivered an energy density of 385 Wh kg^{-1} at C/10, with 89% capacity retention after 100 cycles. The fabrication process—based on simple carbonization and mechanical mixing—was highlighted for its scalability and industrial feasibility, avoiding complex synthesis steps. Comparative electrochemical analyses confirmed the superior specific capacity and rate capability of the hybrid anodes relative to graphite, positioning them as promising candidates for next-generation lithium-ion battery (LIB) technologies.



The seminar concluded with a dynamic Q&A session, where attendees explored topics ranging from materials design and scalable manufacturing to potential collaborative research opportunities. Prof. Chao's visit not only fostered academic exchange but also reinforced shared institutional goals in advancing sustainable, biomass-derived energy materials for practical applications.