



Department of Materials Science and Engineering Seminar Series 2025

Sustainable Moisture-based Energy Harvesting from Ambient Moisture

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Date and time: Oct. 8th 2025, 10:00 am – 12:00 pm

Venue: E3-06-01

Abstract

Ambient water vapor is an abundant but underutilized energy resource. Herein ,we introduced our latest research progress in developing new materials and device architectures to convert it into reliable electricity as a sustainable energy harvesting approach. First, an asymmetric hygroscopic hydrogel-carbon fabric structure is designed, where selective hydrogel coating creates a stable wet–dry asymmetry. This architecture sustains continuous power generation, with mechanistic studies revealing how confined water states and interfacial ion transport contribute to voltage output. Second, an eco-friendly strategy is demonstrated by repurposing fallen leaves into energy harvesters. Their intrinsic microstructures, such as central veins and porous cell layers, enable superior performance compared to synthetic substrates. A life-cycle assessment further highlights the environmental benefits and scalability of this green approach. Finally, we expands moisture harvesting into programmable hygroelectronic interfaces. Patterned hydrogels generate distinct humidity-responsive signals for applications in interactive sensing and information encryption, introducing a multifunctionality for hygroelectronics.

Biography

Guo Shuai received his bachelor degree in Beijing Institute of Technology. He is currently a Ph.D. candidate at the MSE department under the supervision of Prof. Tan Swee Ching. His current research aims to develop hygroscopic materials for energy generation and devices for water treatment.

Please join us!

HOST: Prof Zhu Di