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INSTITUTO DE FÍSICA APLICADA E ENGENHARIA DE MATERIAIS
INSTITUTE OF APPLIED PHYSICS AND MATERIALS ENGINEERING



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IAPME Seminar

Celebrating the 45th Anniversary of the University of Macau: Flexible solid state thermal management materials and devices with high efficiency



18 May 2026

Prof. Rujun MA

Nankai University

Venue: N23-4018

Time: 16:00 - 17:00

Hosted by: Prof. Qibing PEI

Abstract

Flexible and low energy consumption thermal management technology is an important guarantee for the future development of high technology. However, traditional thermal management systems typically consume large amounts of electricity, which are not environmentally friendly. Here, we have carried out research on flexible, energy-saving and efficient solid-state thermal management systems, ranging from low energy consumption of the electrocaloric effect to zero energy consumption of the radiation effect thermal management system, and then to the self-sustainable wearable solid-state thermal management system. The low-energy thermal management system with electrocaloric effect is not only environmentally friendly, highly efficient, miniaturized and simple in structure, but also allows precise temperature control of electronic devices in space and time. The zero-energy thermal management system with radiation effect not only solves the limitations of the traditional radiation thermal management system in response to dynamic temperature changes but also realizes the zero-energy switching effect of the dual-mode of heat preservation and refrigeration. In addition, the self-sustainable all-weather wearable thermal management clothing fundamentally solves the energy supply problem of the electrocaloric effect thermal management system, realizes rapid body temperature adjustment according to the cooling/heating demand of the human body. This energy-saving solid-state thermal management system provides theoretical and technological support for the low energy consumption thermal management technology.

Biography

Prof. Rujun MA is a Professor in the School of Materials Science and Engineering of Nankai University. He was awarded the China Youth Science and Technology Award and has led many key projects of the National Key R&D Program of the Ministry of Science and Technology, and the National Natural Science Foundation of China, etc. He graduated from the College of Nanotechnology, Sungkyunkwan University, South Korea, with a Ph.D. degree in 2013, and then worked as a postdoctoral researcher in Sungkyunkwan University. In 2015, he joined Prof. Qibing PEI's group at UCLA as a postdoctoral researcher, and he joined the School of Materials Science and Engineering at Nankai University in 2018.

His main research interests are flexible active/passive solid-state cooling materials and devices and multifunctional flexible thermoelectric materials and devices. In recent years, he has published in Science (2), PNAS, Nature Communications (5), Joule (2), Chemical Society Reviews, Advanced Materials (5), Nano Letters (10), etc. He has been authorized more than 20 patents in the United States, China, and South Korea, and has applied for 2 international patents.

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