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

IAPME Seminar

Ultrahigh Energy Storage Performance of Layered Polymer Nanocomposites over a Broad Temperature Range

Prof. Lingmin YAO
Guangzhou University

Date: 7/11/2022; Time: 14:30 - 15:30; Zoom

Polymer film capacitors with high power density, fast charging-discharging speed and long cycle life play a vital role in advanced electronics and power systems. However, the operating environment requires polymer film capacitors with the ability to maintain high efficiency and high energy density over a wide temperature range. Therefore, we are committed to integrate the advantages of inorganic fillers (with wide band gap, high thermal conductivity) and polymers (with high glass transition temperature) to improve energy storage performance over a broad temperature range. Polymer composites consisting of BNNS/PEI and TiO_2 nanorod arrays/polyetherimide layers are designed by us and the results show the composites could maintain good cyclability and dielectric stability over the temperature range of 25-150 °C. In addition, the laminated film exhibits a high energy storage density of 10.4 J/cm3 and a high energy storage efficiency of 82.6% at a high temperature of 150 °C. This work addresses the current challenge in the enhancement of the energy densities of high-temperature dielectric polymers and demonstrates an efficient route to dielectric polymeric materials with high energy densities and low loss over a broad temperature range. The research on the new thermal conductivity structure design will provide important guidance for the optimization of high-temperature energy storage performance of dielectric composites, which is of great significance to the energy-saving and lightweight design of energy storage devices.

Introduction of speaker

Prof. Lingmin Yao got her master degree in the South China Normal University in 2014 and PhD from the Applied Physics and Materials Engineering at the University of Macau in 2017. She joined in Guangzhou University as an Assistant Professor in 2017. She was promoted to Associate Professor in 2020. Her research is focused on the synthesis of organic-inorganic composites for the DC/AC inverter over a broad temperature range. Her research interests also include actuator sensors based on the piezoelectric materials, and electrochemical energy storage and conversion (Li-ion/Li-sulfur/batteries). She has published more than 20 papers in the high-impact journals, such as Adv. Mater., J. Mater. Chem. A, Nanoscale, and ACS Appl. Mater. Interfaces, which were cited more than 800 times.

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