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NANODIELECTRICS FOR HIGH-TEMPERATURE FILM CAPACITORS

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Polymeric dielectric materials enable film capacitor technology that is critical in high-power energy storage and pulsed power systems, hybrid electric vehicles, aerospace power conditioning and advanced electromagnetic weapons. Conventional high-temperature polymeric dielectric materials dissipate a large amount of heat as they are involved in continuous operations under high temperature and strong electric field conditions, which, unfortunately, leads to thermal runaway and failure of film capacitors. We propose to tackle the key issues associated with thermal runaway in plastic film capacitors by focusing on the suppression of charge injection from electrodes and thermally activated migration of charge carriers, rather than following the traditional design of high-temperature polymer dielectrics that only concerns the thermal stability of materials. Advanced composite approaches, thin-film deposition technologies, comprehensive characterizations of dielectric and capacitive energy storage properties as well as computational simulations are utilized to cover from structure control to material preparation, to performance assessment and to device modelling. The ultimate goal of this study is to develop novel high-temperature polymer dielectrics that can maintain dielectric stability and energy storage properties under high electric field and high temperature, and effectively suppress the thermal runaway of plastic film capacitors.

Biography

Qi Li is currently an Associated Professor of Electrical Engineering at Tsinghua University, China. He received his PhD degree in Materials Science at Wuhan University of Technology, China in 2013. From 2013 to 2016, he was a Postdoctoral fellow at the Department of Materials Science and Engineering of the Pennsylvania State University. He started his appointment at the Department of Electrical Engineering of Tsinghua University in December 2016. His research interest has been focused on polymer-based nanocomposite materials with unique dielectric properties for electrical energy storage and conversion. He has published over 50 SCI-indexed papers in *Nature, PNAS and Nature Communications*, etc. He was awarded the MRS Postdoctoral Award in 2016 because of his scientific achievement in polymer nanocomposites for energy storage and conversion. He is an Editorial Board Member of *IET Nanodielectrics*, and is the Guest Editor of Special Issue Polymers for Film Capacitors published by Materials.

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