

International Webinar on Gels and Networks



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Understanding Ion Transport and Relaxation Processes in Nanocomposite Polymer Electrolytes

ABSTRACT: Polymer electrolytes are of great interest as materials in energy storage devices because of ion conducting polymers enabling good adherence to electrodes and excellent processability for being made into thin film. The key challenge facing the development of polymer electrolytes for energy storage applications is to achieve high mechanical performance without sacrificing the requisite ionic conductivity. This makes it possible to stop the formation of lithium dendrite, which is detrimental to the devices.

We prepared epoxy-based networked polymer electrolytes including Li salts with either plastic crystals or ionic liquids. The curing of a homogeneous mixture of epoxy and electrolyte could generate a two-phase system in which the epoxy phase was selected to provide mechanical strength and the electrolyte phase was selected to maximize ionic conductivity. To further introduce multifunctional properties, nanocomposite polymer electrolytes were also prepared by combining non-aqueous or aqueous gel polymer electrolytes with inorganic nanoparticles. We systematically conducted an investigation of the effect of electrolyte types and their concentration on the conductometric, dielectric, and rheological properties of the networked polymer electrolytes, using dielectric relaxation spectroscopy and oscillatory shear. These results were complemented by morphology studies in order to understand structure-property relations. Our study leads to insight regarding optimal design of multifunctional electrolytes for energy storage devices.

GOALS:

- Investigation of the dynamics of ion and polymer chain motion in polymer electrolytes
- Understanding ion transport mechanism required to create high-conducting polymer electrolytes with high-performance mechanical properties
- Demonstration of optimized polymer electrolytes as energy applications

ABOUT THE WEBINAR:

Due to the ongoing global crisis involving COVID-19, there is little chance for the soft matter community to meet to learn about gels and networks. We propose this seminar as a way for members of the European and Asian communities to share our research and learn from each other, even when social distancing is necessary. The tone of this webinar is informal, and questions can be freely asked at any time. We welcome open discussion, and hope that all who attend will learn a lot!

Webinar website: <http://www.fp.a.u-tokyo.ac.jp/lab/sozai/seminar.html>

Registration:

<https://u-tokyo-ac-jp.zoom.us/meeting/register/tZEIcOCuqzMoGtw3mAQQLJYWfFu4aP7aOcSqS>

Date: Friday, November 19th, 2021

Time: 17:00-18:30 JST, 9:00-10:30 CET

Cost: Free

Organizers:

Daniel King (Hokkaido University)

Koichi Mayumi (University of Tokyo)

Tetsuo Yamaguchi (University of Tokyo)

Tetsuharu Narita (ESPCI Paris)