Independent Study at SIEN Lab
Fabricating novel ionic-liquid-polymer solid electrolytes

Ionic liquids are a novel type of compounds known for its conductivity, remarkable stability, non-volatility, and chemical versatility. In SIEN, we study the physical and chemical properties of ionic liquids and their mixtures with other compounds, to develop novel electrolytes. Specifically, we wish to fabricate new composite materials using ionic liquids and polymers, which can serve as solid electrolytes to make batteries and solar cells. At the initial stage, different ratios of ionic liquid and polymer will be systematically explored to fabricate self-standing composite materials, which will be characterized by thermal analysis followed by various spectroscopic methods. At the second stage, selected samples will be tested on their electro-chemical and mechanical properties. Coupled with nanoscopic investigations, the study will provide insights on charge transport, mechanical strength, and molecular interactions in the novel composite material to provide hints for optimal design. The student will be tasked to fabricate a series of samples and characterize them with differential scanning calorimetry, infrared spectroscopy, and dynamic light scattering. Through the project, the student will be granted the opportunities to get involved in designing experiments and to learn various techniques crucial for material fabrication and characterization. The student will be supervised by a Ph.D. student who will help create research plans and provide guidance when necessary.

The student will be involved in:

- Designing detailed research plan
- Fabricating composite materials using polymers and ionic liquids.
- Operating Fourier-transformed infrared spectroscopy, dynamic light scattering, and differential scanning calorimetry.
- Analysis of experimental data.
- Discussions with the Ph.D. supervisor and the PI

Preferred background:

Preferable for students with a past experience in wet-lab chemistry. Experience in the aforementioned instruments will be desired.

Contact Person: Prof. Rosa M. Espinosa-Marzal (rosae@illinois.edu)

Website: https://publish.illinois.edu/rosaespinosamarzal/