

### “Building Simple and Complex Polymer Materials Inspired by Ionic Liquids”

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Chemical and Biological Engineering

Host: Tim Long



**Abstract:** In comparison to other methods of radical polymerization, photopolymerization reactions offer multiple advantages including a greater degree of spatial and temporal control. However, as these processes are often performed in bulk conditions, they are subject to mass transfer limitations that result in relatively poor polymerization kinetics. To address this problem, multiple types of structured media have been examined, but lack direct applicability to commodity monomers and polymers. In our current work, we examine coordinated ionic liquids produced from the bistriflimide anion and polar organic monomers coordinated to lithium cations. It is shown that the presence of lithium bistriflimide improves overall monomer conversion and photopolymerization kinetics and that the lithium bistriflimide can be recovered quantitatively post-polymerization. This approach offers facile access to many types of new inorganic-organic hybrids and may be used to improve certain forms of 3-D printing.

Polyimides and ionic liquids have each emerged as promising classes of materials for advanced membranes, especially with regard to CO<sub>2</sub> removal from flue gas or natural gas. Despite their seemingly disparate natures, our group has developed methodologies by which these two very distinct materials are compatibilized into a single, highly tailorable and robust structure. The hybridization of polyimides with ionic groups presents unprecedented opportunities to design new materials featuring unique nanostructures/free volume characteristics that arise from supramolecular assembly and non-covalent interactions with added ionic liquids. This presentation will detail our design philosophy, synthetic approach, polymer structure-property relationships and initial performance as gas separation membranes.

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**Bio:** Jason received a B.S. in Chemical Engineering from Virginia Commonwealth University and a Ph.D. in Chemical Engineering from The University of Colorado at Boulder. He has authored 70 peer-reviewed research publications and 5 book chapters on the topics of CO<sub>2</sub> capture, ionic liquids, polymer membranes, nanostructured materials, and chemical process engineering. Jason was the 2015 winner of the AIChE FRI/John G. Kunesh Award from the Separations Division. In addition to his active research group, Jason has also made broadly reaching educational impacts in the areas of 3-D printing and the development of mobile apps such as Chemical Engineering AppSuite, Engineering Unit Converter & Calculator and ODEsueus: Numerical Solver for Differential Equations on iPhones and iPads.

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