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Development and applications of lower cost high performance ionic conducting polymers

High performance ionic conducting polymers are widely used in the energy conversion and storage devices, desalination processes and other areas. Commercially available perfluorinated polymer based ionomers bearing perfluoroalkylsulfonic acid groups such as Nafion[®] polymer have shown great electrochemical stability and good ionic conductivity. However, its relatively high cost and low solvent barrier property have limited its applications in many areas. Many fluorinated ionomers such as sulfonated polysulfone, sulfonated polyimide and others have been developed as lower cost alternatives, but they lack the electrochemical stability and ionic conductivity to support long term energy related applications. In this presentation, we will discuss our strategy in creating lower cost high performance ionic conducting polymers with aromatic backbones bearing fluorinated side chains connecting to fluorinated alkyl sulfonimide groups. Due to the strong electronic withdrawing effects from the fluoroalkylsulfonyl groups, the negative charge on the nitrogen of sulfonimide anion could be widely delocalized and stabilized, resulting in the high mobility of the counter cations in the system. The materials showed improved solvent barrier properties because of their tighter ionic conducting channels. After summarizing our work in the syntheses of the materials, we will discuss recent progress in developing potential applications in rechargeable lithium ion battery, all vanadium redox flow battery, low energy and low cost electro-dialysis device, and total heat exchange energy recovery ventilation system.

Biography

Lixin Xue, the Chief Scientist of Ningbo Institute of Industrial Technologies, Chinese Academy of Sciences (NIMTE, CAS), has published over 80 scientific papers and 150 patents including 33 PCT patents. His research interest is focused on the areas of fabricating functional polymer membranes and exploring their applications in the fields of green energy generation and storage, energy conservation and environment protection. He has served as a Reviewer for various international journals including *Journal of Materials Chemistry*, *Journal of Membrane Science*, *Desalination and Separation and Purification Technology*. He is also a Member of the "Thousand Talent Program" of Chinese Government.

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