MAR15-2014-030046

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

Ionomer Dynamics: Insights from Broadband Dielectric Spectroscopy*[1]

JAMES RUNT, Pennsylvania State University

Ionomers (polymers containing ionic functionality) have been traditionally used as packaging materials and in molding applications, and are now of increasing interest as candidate single ion conductors for energy storage devices, in energy conversion, and for other electroactive materials applications. The focus of this presentation is on the insight that broadband dielectric (impedance) spectroscopy brings to our understanding of ion and polymer dynamics of this family of materials. As an example of our recent work on relatively conductive ionomers, the first portion of the presentation will focus on anion conducting polyphosphazene ionomers, in which polymer bound cations are quaternized with either short alkyl or short ether oxygen chains. The low Tg, amorphous nature, and cation-solvating backbone distinguish polyphosphazenes as promising materials for ion conduction, the iodide variants being of particular interest in solar cells. In the second part of this overview, the first findings on the molecular dynamics of linear precise polyethylene-based ionomers containing 1-methylimidazolium bromide pendants on exactly every 9th, 15th, or 21st carbon atom will be summarized. In order to develop a robust interpretation of the dynamics of these materials, it is imperative to develop a thorough understanding of microphase separation (e.g. ion aggregation), and each of the above studies is complimented by multiangle X-ray scattering experiments.

[1]*Supported by the NSF Polymers Program and DOE Basic Energy Sciences