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Weakening Ion Interactions in Ionomers using Ionic Liquid Counterions GREGORY TUDRYN, RALPH H. COLBY, Penn State University — Anionic poly(ethylene oxide)-based ionomers are candidate materials for electro-active devices due to the ability of ether oxygens to solvate conducting cations. Conventional alkali metal cations in sulfonated PEO-ionomers are exchanged to ionic liquid counterions and electrical and mechanical properties are measured. Electrode polarization in dielectric spectroscopy is used to determine number density and mobility of conducting counterions. Conductivity and mobility increase with counterion size and exhibit Vogel temperature dependences, meaning counterion motion is coupled with polymer segmental motion. Conducting ion concentrations show Arrhenius temperature dependences, with activation energy reduced as counterion size increases. Oscillatory shear and SAXS suggest ions do not microphase separate, presumably due to ether oxygen solvation of cations. Ionomers with small counterions have higher plateau moduli than larger counterions, suggesting small counterions form more stable quadrupoles. Such studies allow fundamental design of ionic conductors for actuators, as ionic liquids provide larger strains and faster response for electro-active devices.

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