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Cation/Anion Associations and Transport in Ionic Polymer Membranes LOUIS MADSEN, JIANBO HOU, ZHIYANG ZHANG, JING LI, Department of Chemistry and Macromolecules and Interfaces Institute, Virginia Tech — Ionic polymer membranes and ionic liquids (ILs) find fruitful applications in a range of ion conduction applications, from electromechanical “artificial muscles” to organic batteries. Various intermolecular interactions determine local structure and dynamics in these ion-dense media. In particular, ion aggregation can drastically affect ion transport, especially since neutral species (dipoles, quadrupoles...) will not be driven by electric fields. We are investigating mixtures of different ILs, ILs with water, and ILs swollen into ionomer membranes, using pulsed-gradient NMR to probe diffusion and electrophoretic mobility. We observe strong dependencies of the cation/anion diffusion coefficient ratio (ranging from 3X to 0.25X) on mixture and membrane properties, which we relate to ion association phenomena. We will further discuss NMR for transport and dynamics studies, especially regarding chemically resolved transport of various mobile species, probing a range of length and time scales, and quantifying ion aggregation.

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