Abstract Submitted
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Understanding Ion Transport in Polymerized Ionic Liquids using Dielectric Spectroscopy[1] U. HYEOK CHOI, Penn State University, HONG CHEN, Drexel University, WENJUAN LIU, Penn State University, YOSSEF A. ELABD, Drexel University, RALPH H. COLBY, Penn State University — In order to deduce the mechanism of ion conduction in ion-containing polymers, not only the conductivity needs to be measured but also the number density and mobility of conducting ions must be determined using broadband dielectric spectroscopy, covering broad frequency and temperature ranges. To obtain a transference number of unity, one ionic charge is covalently bonded to the polymer so that only the counterions can contribute to ion conduction. In this study, imidazolium-containing monomer was synthesized and polymerized to make a cationic homopolymer with either tetrafluoroborate or bis(trifluoromethanesulfonyl)imide anionic counterions. These ions can associate into pairs and larger aggregates. The degree of ion pairing can be estimated from the temperature dependence of the dielectric constant and knowledge of the dipole moment of the ion pair, using the 1936 Onsager equation. Using the 1953 Macdonald model makes it possible to determine concentration and mobility of mobile counterions from analysis of electrode polarization in dielectric spectroscopy.

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