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Multivalent Ion Transport Through Polymerized Ionic Liquids[1]
NICOLE MICHENFELDER-SCHAUSER, GABRIEL SANOJA, RACHEL SEGALMAN, Univ of California - Santa Barbara — Fundamental studies of multivalent ion transport through polymers have been limited due to a lack of polymer systems that can dissolve multivalent salts but still allow for appreciable ion motion upon application of an electric field. Multivalent ion transport in polymers is made possible by exploiting kinetically labile metal-ligand coordination in a polymerized ionic liquid (PIL). A poly(ethylene oxide)-based polymer with pendant imidazole groups is mixed with various metal-bis(trifluoromethanesulfonyl)imide salts to form PILs with low glass transition temperatures. The ion transport characteristics of each PIL are characterized via AC impedance spectroscopy and show comparable conductivities for monovalent, divalent and trivalent ions roughly 1.5 orders of magnitude higher than the neat polymer. We use molecular characterization techniques to quantify kinetic rate parameters that have an impact on conductivity. We determined simple scaling relationships, beyond solely correcting for segmental chain motion, that create a unified description of transport mechanism for multivalent ion transport through polymeric systems.

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