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Solid Polymer Electrolytes by Self Assembly of Multi-Ionic Janus POSS Li-Salts in Polyethylene Oxide STEPHANIE WUNDER, PARAMESWARA RAO CHINNAM, Temple University — Solid polymer electrolytes (SPEs), of which the most investigated has been polyethylene oxide (PEO), have low room temperature (RT) ionic conductivities and low lithium ion transport numbers. PEO is semicrystalline, with a glass transition temperature, T_g, of -60 ^{o}C and a melt temperature, T_m of $\sim$ 65 ^{o}C. Since lithium ion conduction occurs in the amorphous phase of PEO, conductivities $> 10^{-4}$ S/cm are only obtained after the crystalline domains have melted. Although high concentrations of lithium salts can eliminate the crystallization that causes the low conductivity at RT, the result is an amorphous liquid, not a solid. In order to impart structural rigidity to a non-crystalline PEO at RT, we have developed Janus-like multi-ionic lithium salts, in which one half of the salt is ionic in character, and the other half is hydrophobic. These salts are highly dissociative, imparting RT conductivities $> 10^{-4}$ S/cm and the hydrophobic ends aggregate. A phase separated morphology is formed in which the hydrophobic moieties form crosslink sites, and impart a solid state morphology, and the Li^+ ions dissociate into the conductive, amorphous PEO phase.

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