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Tuning the ionic conductivity in protic polymerized ionic liquid homo, random, and block copolymers CHRISTOPHER EVANS, RACHEL SEGALMAN, University of California-Santa Barbara, UCSB TEAM — Proton conducting membranes are of interest for a number of energy applications including use in fuel cells and artificial photosynthesis systems. We have synthesized a new class of protic polymerized ionic liquids (PILs) based on imidazolium cations which exhibit high conductivities in the solid state. In contrast to previous imidazolium based PILs, the ionic liquid moiety is attached via a carbon on the imidazole thus leaving the two nitrogens available to act as a proton donor/acceptor. The conductivies of these protic PILs, measured by dielectric spectroscopy, are orders of magnitude higher than the analogous non-protic PILs at a given distance above (Tg). These high conductivities are the result of a strong contribution from proton motion. A series of random and block copolymers containing the polymerized ionic liquid monomer and a non-ionic comonomer were also investigated to determine the role of comonomer on the conductivity of these materials. It was found that methyl acrylate, which has a low glass transition temperature and high dielectric constant, can result in improvements of ionic conductivity. Studies using solid state NMR are underway to understand the role of protons and mobile anions in controlling the overall conductivity of these materials.

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