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Jeffrey Pyun, Alshakim Nelson, Christopher Stafford

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103 - Designer block ionomer networks for responsive technologies

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Electroactive polymers (EAPs) and shape-memory polymers (SMPs) constitute two important material classes for emerging responsive technologies. In this work, we introduce a new class of block ionomers that can be used as EAPs, specifically as ionic polymer-metal composite (IPMC) that respond to an external electrical potential and SMPs that respond to temperature changes to undergo deformation. These ionomers are obtained by midblock sulfonation of ABA type nonpolar thermoplastic elastomers. Sulfonation results demonstrate the viability of this approach and its potential in preparing designer ionomers that vary in the degree of sulfonation, form robust films and retain the molecular network in presence of a polar solvent. The utility of midblock-sulfonated ionomers as IPMC and SMP candidates in responsive technologies is established. This mid-block sulfonated ionomer design provides facile tunability of the ionic content and morphology, which is not possible in currently available block ionomers.

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