# SELF-ASSEMBLY OF BLOCK COPOLYMERS IN IONIC LIQUIDS-: ULTRASTRETCHABLE IONO-ELASTOMERS WITH MECHANOELECTRICAL RESPONSE

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Self-assembly of amphiphilic block copolymers can impart desired discrete or continuous nanostructures, such as micelles utilized as drug delivery vehicles in aqueous solvents, or cross-linked micelles for stretchable electronics fabrications in ionic liquids. These appealing applications have motivated significant research efforts to understand the nano- and microstructure as well as the structure-property relationships underlying such self-assembled systems, with the ultimate goal being effective formulation. To take full advantage of the bottom-up self-assembly approach, a comprehensive understanding of the factors that govern the self-assembly behavior of dilute, concentrated and functionalized system of non-ionic block copolymers self-assembly in ionic liquids, as well as robust characterization methods for quantifying the microstructure and properties relationship must be reviewed. For each system, the most significant challenges are presented and discussed. In addition, current and potential applications of block copolymers/ionic liquid system are also discussed, such as iono-elastomers.

The emerging technologies involving wearable electronics require new materials with high stretchability, resistance to high loads, and high conductivities. We report a facile synthetic strategy based on self-assembly of concentrated solutions of end-functionalized PEO106-PPO70-PEO106 triblock copolymer in ethylammonium nitrate into face-centered cubic micellar crystals, followed by micelle corona cross-linking to generate elastomeric ion gels (iono-elastomers). These materials exhibit an unprecedented combination of high stretchability, high ionic conductivity, and mechanoelectrical response. The latter consists of a remarkable and counterintuitive increase in ion conductivity with strain during uniaxial extension, which is reversible upon load release. Based on in situ SAXS measurements of reversible crystal structure transformations during deformation, we postulate that the origin of the conductivity increase is a reversible formation of ion nanochannels due to a novel microstructural rearrangement specific to this material.