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Ionic Conductivity of Nanostructured Block Copolymer and Ionic Liquid Membranes MEGAN L. HOARFROST, JUSTIN M. VIRGILI, RACHEL A. SEGALMAN, UC Berkeley and Lawrence Berkeley National Labs — Block copolymer and ionic liquid mixtures are of interest for creating ionically conductive, thermally stable, and nanostructured membranes. For mixtures of poly(styrene-b-2-vinylpyridine) (S2VP) and the ionic liquid bis(trifluoromethanesulfonyl)imide ([Im][TFSI]), nanostructured ion-conducting domains are formed due to [Im][TFSI] selectively residing in the P2VP domains of the block copolymer. The dependence of ionic conductivity on temperature, ionic liquid loading, and volume fraction of PS in the neat block copolymer was investigated for membranes with the matrix phase being P2VP/[Im][TFSI]. It was determined that the temperature dependence of conductivity follows the Vogel-Tamman-Fulcher equation, with the activation energy determined by the ratio of [Im][TFSI] to 2VP monomers. The overall weight fraction of [Im][TFSI] in the mixtures, however, is the dominating factor determining conductivity, regardless of PS volume fraction. The insight gained from this work will be important for further investigation into the effect on the ion transport properties of ionic liquids when confined to minority nanostructured domains.

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