

Abstract Submitted
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Effect of Confinement on Proton Transport in Nanostructured Block Copolymer/Ionic Liquid Membranes MEGAN L. HOARFROST, University of California, Berkeley, MADHU S. TYAGI, NIST Center for Neutron Research, RACHEL A. SEGALMAN, JEFFREY A. REIMER, University of California, Berkeley — Nanostructured membranes containing structural and proton-conducting domains are of great interest for a wide range of applications requiring high conductivity coupled with high thermal stability. Understanding the effect of nanodomain confinement on proton-conducting properties in such materials is essential for designing new, improved membranes. This relationship has been investigated for a lamellae-forming mixture of poly(styrene-*b*-2-vinylpyridine) (PS-*b*-P2VP) with ionic liquid composed of imidazole and bis(trifluoromethane)sulfonimide (HTFSI), where the ionic liquid selectively resides in the P2VP domains of the block copolymer. Quasi-elastic neutron scattering and NMR diffusion measurements reveal high levels of a fast proton hopping transport mechanism, which we hypothesize is due to changes in the hydrogen bond structure of the ionic liquid under confinement. This, in combination with unique ion aggregation behavior, leads to a lower activation energy for macroscopic ion transport compared to that in a mixture of ionic liquid with P2VP homopolymer. These results portend the rational design of nanostructured membranes having improved mechanical properties and conductivity.

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