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Phase Behavior of Block Copolymer Solutions in an Ionic Liquid J.M. VIRGILI, M.L. HOARFROST, N.P. BALSARA, R.A. SEGALMAN, UC Berkeley — Incorporation of ionic liquids into block copolymers is of interest for applications such as high temperature fuel cell membranes. We investigate the lyotropic and thermotropic phase behavior of solutions of poly(styrene-*b*-2-vinyl pyridine) (S2VP) block copolymers in an ionic liquid consisting of imidazole and bis(trifluoromethane)sulfonamide (HTFSI). Using small angle X-ray scattering (SAXS) and static birefringence, we demonstrate that the ionic liquid behaves as a selective solvent, preferentially solvating the poly(2-vinyl pyridine) segment of the block copolymer. At moderate to high concentrations ($\geq$ 40 wt%) of copolymer, we observe lyotropic phase transitions to lamellar and cylindrical (hcp) nanostructures. At low concentrations of S2VP copolymer ($\leq$ 30 wt%), we observe poorly-ordered, microphase-separated structures, which do not resemble the face-centered cubic or body-centered cubic spherical micelles observed in block copolymer solutions in molecular solvents. We observe that the order-disorder transition temperature of the series of SVP copolymers does not depend strongly on the concentration of the block copolymer solution in ionic liquid.

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