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Anisotropic Proton Conduction in Aligned Block Copolymer Electrolyte Membranes at Equilibrium with Humid Air MOON PARK, Department of Chemistry, POSTECH, NITASH BALSARA, Department of Chemical Engineering, UC Berkeley — The effect of alignment of proton-conducting domains in hydrated poly(styrenesulfonate-b-methylbutylene) copolymer films on conductivity was studied by impedance spectroscopy. Pressing isotropic samples obtained by casting results in lamellae aligned in the plane of the film. Application of electric fields and flow fields on the isotropic samples results in lamellae aligned perpendicular to the plane of the film. The alignment of lamellae, quantified by a combination of 2D SAXS, birefringence, and TEM, was much better in the pressed samples than in the field-aligned samples. Conductivity was measured in the plane of the film and normal to the plane of the film. Only the pressed sample showed highly anisotropic proton conduction with the ratio of 75. In this case, the parallel conductivity increased by 30% after alignment, relative to that obtained from the as-cast samples. The conductivity ratio obtained from after electric field and shear field alignment were 1.2 and 1.4, respectively, in spite of partial alignment of the domains, and the increase in the perpendicular conductivity after alignment was less than 20 percent.

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