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Transport and phase behavior in anion-conducting diblock copolymers GUILLAUME SUDRE, Lawrence Berkeley National Laboratory, SEBNEM INCEOGLU, University of California, Berkeley , NITASH BALSARA, UC Berkeley and LBNL — Anion-exchange membranes can be used in various applications such as direct methanol fuel cells or devices for artificial photosynthesis. Consequently, these membranes have to conduct the anions efficiently, remain insoluble in water or methanol, and be impermeable to various gases. Block copolymers are good candidates to reach these aims. Their ability to self-assemble, particularly into bi-continuous phases, makes it possible to use one polycationic block that would conduct the anions, while a second neutral block can be designed as a structural block to insure the mechanical stability of the system. Our study focuses on the relationship between phase behavior and anion conductivity of diblock copolymers as a function of molecular weight, composition and cationic groups. We have chosen to use a model system made of styrene for the neutral block, and of chloromethylstyrene for the second block since it is easily cationizable with various functionalities, reacting easily with e.g. trimethylamine or n-butylimidazole. This model system is synthesized by nitroxide-mediated radical polymerization with molecular weights between 2 to 40 kg/mol and fractions of chloromethylstyrene in the range of 15-40 mol%. The results obtained from small-angle X-ray scattering showed lamellar morphologies for most systems. The temperature-dependence of the conductivity was assessed by performing measurements on membranes that were either immersed in water or in a controlled atmosphere at 98% of relative humidity.

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