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Connecting ion transport in polymer electrolytes across length scales KSENIA TIMACHOVA, University of California, Berkeley, LISA CIRRINCIONE, STEVEN GREENBAUM, City University of New York, Hunter College, NITASH BALSARA, University of California, Berkeley — Ion transport in polymers has been extensively studied in an attempt to improve upon the disadvantages of conventional liquid electrolytes. We combine pulsed-field gradient NMR diffusion measurements with electrochemical transport measurements in ethylene oxide based homo and block copolymer electrolytes in order to elucidate some of the connections between macroscopic properties like conductivity and molecular architecture, diffusion, and electrostatic interactions. In homopolymer electrolytes, a single diffusion coefficient governs transport from the micro to the mesoscale. In block copolymers, multiple diffusion regimes are seen at different length scales; diffusion on the microscale is faster than that on the mesoscale. In both materials, the strength of molecular interactions dictates how these molecular diffusion coefficients connect to macroscopic transport. We discuss how molecular interactions and diffusive processes inform bulk ion transport in polymer electrolytes.

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