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Mechanisms underlying conductivity of lamellar block copolymer electrolytes VENKAT GANESAN, VICTOR PRYAMITSYN, The University of Texas at Austin — Recent experiments have reported intriguing trends for the molecular weight (MW) dependence of the conductivity of block copolymer lamellae which are opposite that exhibited by homopolymer matrices. Using coarse-grained simulations of the transport of penetrant ions, we probe the possible mechanisms underlying such behavior. Our results indicate that the MW dependence of the conductivity of homopolymeric and block copolymeric matrices owe their origins to different mechanisms. On the one hand, the solubility of penetrants in block copolymer matrices themselves exhibit a MW dependence which arises from the MW dependence of the thickness of the conducting phase relative to the interfacial zones. Moreover, distinct mechanisms are shown to be responsible for the mobilities of ions in homopolymer and block copolymers. In the former, the mobility effects associated with the free ends of the polymers play an important role. In contrast, in block copolymer lamellae, the interfacial zone between the blocks presents a zone of hindered mobility for ions and manifests as a molecular weight dependence of the ionic mobility. Together, the preceding mechanisms are shown to provide a plausible explanation for the experimentally observed trends for the conductivity of block copolymer matrices.

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