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Conductivity Scaling Relationships for Nanostructured Block Copolymer/Ionic Liquid Membranes MEGAN HOARFROST, University of Minnesota, RACHEL SEGALMAN, University of California, Berkeley — Nanostructured membranes containing structural and ion-conducting domains are of great interest for a wide range of applications requiring high conductivity coupled with high thermal stability. To optimize the properties of such membranes, it is essential to understand scaling relationships between composition, structure, temperature, and ionic conductivity. The conductivity behaviors of mixtures of two block copolymer chemistries with two different ionic liquids have been investigated. The conductivities of all the mixtures are described by a single expression, which combines the Vogel-Tamman-Fulcher (VTF) equation with percolation theory. The VTF equation takes into account the effect of the glass transition temperature of the conducting phase on the temperature dependence of conductivity, while percolation theory reflects the power law dependence of conductivity on the overall volume fraction of ionic liquid in the membrane. The dominance of the overall volume fraction of ionic liquid in determining conductivity indicates that there is incredible flexibility in designing highly conductive block copolymer/ionic liquid membranes.

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