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Effect of matrix chemical heterogeneity on effective filler interactions in model polymer nanocomposites LISA HALL, Sandia National Laboratories, KENNETH SCHWEIZER, University of Illinois Urbana-Champaign —
The microscopic Polymer Reference Interaction Site Model theory has been applied to spherical and rodlike fillers dissolved in three types of chemically heterogeneous polymer melts: alternating AB copolymer, random AB copolymers, and an equimolar blend of two homopolymers. In each case, one monomer species adsorbs more strongly on the filler mimicking a specific attraction, while all inter-monomer potentials are hard core which precludes macrophase or microphase separation. Qualitative differences in the filler potential-of-mean force are predicted relative to the homopolymer case. The adsorbed bound layer for alternating copolymers exhibits a spatial moduluation or layering effect but is otherwise similar to that of the homopolymer system. Random copolymers and the polymer blend mediate a novel strong, long-range bridging interaction between fillers at moderate to high adsorption strengths. The bridging strength is a non-monotonic function of random copolymer composition, reflecting subtle competing enthalpic and entropic considerations.

Lisa Hall
Sandia National Laboratories

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