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Effect of Nanowire Size Dispersity and Orientation on Electrical Conductivity in Polymer Nanocomposites ROSE MUTISO, MICHELLE SHERROTT, University of Pennsylvania, JU LI, Massachusetts Institute of Technology, KAREN WINEY, University of Pennsylvania — We model the percolation threshold (ϕ_c) and electrical conductivity of isotropic and oriented three-dimensional networks containing finite, conductive cylinders with experimentally typical (Gaussian) and engineered (bidisperse) distributions in their length and/or diameter. Our results show that narrow Gaussian distributions do not affect the threshold concentration or electrical conductivity significantly in either isotropic or oriented networks. In contrast, the addition of a small fraction of longer rods in a bidisperse system can improve the electrical properties considerably. We have also successfully extended the excluded volume percolation theory to predict ϕ_c of polydisperse networks of soft-core rods with finite-L/D by generalizing the monodisperse case and applying an empirical calibration factor from our simulations. Our analytical expression finds the critical concentration in nanocomposites with arbitrary distributions in L and/or D.

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