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Simulation of Electrical Conductivity of Composites Containing Uniaxially-Aligned, Finite Rods above the Percolation Threshold SADIE WHITE, University of Pennsylvania, BRIAN DIDONNA, LAI-CHING CHOU, TOM LUBENSKY, KAREN WINEY, University of Pennsylvania — Simulations probed the percolation behavior of composites containing isotropic and uniaxially aligned, conductive, cylindrical fillers with aspect ratios of 10, 20, and 80. In addition, the random resistor network model was used to calculate the electrical conductivity of these composites at concentrations above the percolation threshold. The observed trends compare favorably with our experimental results in carbon nanotube and carbon nanofiber polymer nanocomposites. For example, the electrical conductivity is highest when the fillers are slightly uniaxially aligned in both simulation and experimental results. In addition, the critical degree of filler orientational order at which the electrical conductivity abruptly decreases was found to depend on rod aspect ratio along the same trends noted for experimental data. This work represents the first simulations of electrical conductivity above the filler percolation threshold for oriented and isotropic composites containing permeable, conductive, finite-sized rods, and is pertinent to the rapidly expanding field of polymer nanocomposites.

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