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Electrical Conductivity in Polymer Nanocomposites with Heterogeneous Spatial Distributions of Nanotubes MINFANG MU, THOMAS J. ACCHIONE, JENA DENG, HENRY FRIEDMAN, KAREN I. WINEY, Department of Materials Science and Engineering University of Pennsylvania, Philadelphia, Pennsylvania 19104-6272 — Recent reports have suggested that a heterogeneous spatial distribution of carbon nanotubes or carbon nanofibers might provide improved properties, when a nanotube-rich phase is both the minority phase and continuous through a macroscopic specimen. Here we present an simple method to prepare composite with high electrical conductivities, that coats polystyrene (PS) beads and then compression molds them to form a piece. Optical microscopy indicates that the fillers remain primarily at the boundaries between the particles and form an electrically conductive network. At 0.5 wt% single wall carbon nanotubes (SWNT), the electrical conductivity is higher in samples with heterogeneous rather than homogeneous spatial distribution. Furthermore, the critical concentration for electrical conductivity is smaller for the nanocomposites with this continuous, nanotube-rich phase. In this particular example, "better" (more homogeneous) nanotube distribution does not provide higher electrical conductivity. We also explore the effect of bead size on the critical concentration for electrical conductivity.

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