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Conducting-tip AFM Studies of Multi-Walled Carbon Nanotube/Polyimide Nanocomposites A. TRIONFI, D. SCRYMGEOUR, J.W.P. HSU, Sandia National Laboratories, M.J. ARLEN, D. WANG, L.-S. TAN, R.A. VAIA, Air Force Research Laboratory — Electrical transport studies of multi-walled carbon nanotube (c-MWNT)/polymer nanocomposites have shown metallic behavior with conductivity $\sigma = \sigma_0 (\phi - \phi_c)^t$ above the percolation threshold. The conductivity depends on three aspects of the conducting network (CN): the conductivity of the constituent c-MWNT, the number of c-MWNT making up the CN, and the detailed interconnectivity of the CN. Using conducting-tip atomic force microscopy (C-AFM), we have studied the density and conductivity of the c-MWNT CN as a function of c-MWNT loading between 0.5 - 5.0 wt % in a polyimide matrix. Using the Principle of Delesse, the volume fraction of the c-MWNT CN can be calculated from the conducting areal density measured in the C-AFM scans. The results of the C-AFM tests have shown localized areas of electrical transport associated with c-MWNT as well a clear dependence of conducting areal density and conductivity on the c-MWNT loading. This work was performed in part at the US Department of Energy, Center for Integrated Nanotechnologies, at Los Alamos and Sandia National Laboratories. Sandia National Laboratories is a multi-program laboratory operated by Sandia Corporation, a Lockheed-Martin Company, for the U. S. Department of Energy under Contract No. DE-AC04-94AL85000.

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