Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Electrical Conductivity in Polymer Composites Containing Metal Nanowires: Simulation and Experiment SADIE WHITE, TARUN VEMULKAR, JOHN FISCHER, KAREN WINEY, University of Pennsylvania — The study of rod percolation behavior has resurfaced in recent years, because it explains electrical conductivity in polymer nanocomposites containing carbon nanotubes and metal nanowires. Common processing techniques result in fillers with L/D $<$ 50, so traditional models, which are only strictly correct in the limit of L/D $\sim \infty$, are ineffective at predicting percolation in these systems. We present a simulation that constructs percolated networks of finite-aspect ratio rods and calculates their electrical conductivity. We will compare our simulation results with polymer composites containing silver nanowires with aspect ratios of $\sim$10 and $\sim$30. Finally, we will present the temperature-dependent electrical conductivity of these composites and interpret the results using the thermal expansion coefficients of polystyrene and silver. These materials act as "thermal switches," wherein electrical conductivity of certain composites can be manipulated by several orders of magnitude over the temperature range from 80K-425 K.

Sadie White
University of Pennsylvania

Date submitted: 21 Nov 2008 Electronic form version 1.4