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Finite-size effects in nanocomposites: experimental and computational studies L.I. CLARKE, M.P. ROMAN, E.W. SKAU, D.R. STEVENS, L.N. DOWNEN, T.J. HOFFMAN, J.R. BOCHINSKI, Department of Physics, NC State University — Many proposed applications for electrically-conducting composite materials (smart textiles, e-m shielding coatings, tissue scaffolds) are nanostructured - that is, characteristic sample length scales may be similar to at least one dimension of the embedded particle. This is particularly true for long aspect-ratio particles such as nanotubes where the length of the particle can approach or exceed the thickness of a thin nanocomposite film or a nanofiber diameter. In these cases, the formation of a particle network and thus the electrical conductivity enhancement is affected by finite size effects, that is, percolation thresholds and the width of the transition to percolation differ with sample size [Stevens et al., *Phys. Rev. E* **84**, 021126 (2011)]. We present experimental electrical conductivity and 3-D continuum Monte-Carlo simulation results on such finite-sized percolation effects for particles with aspect ratios of 1 to 1000 and discuss proposed scaling laws and techniques to improve conductance in the finite-size regime.

Laura Clarke
Department of Physics, NC State University

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