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Impact of complex geometries on the percolation in nanocomposites D.R. STEVENS, L.N. DOWNEN, L.I. CLARKE, Dept. of Physics, NC State University — As utilization of nanocomposites (polymer matrix doped with a nanoparticle) expands, the prevalence of composites with complex morphologies is increasing. Nanocomposite materials are desirable in that the addition of a nanoparticle can produce a significant alteration in properties such as electrical conductivity, while retaining some of the processability associated with the neat polymer. Enhancements of the mechanical or electrical properties are dependent on the formation of continuous networks of particle within the composite volume. This percolation process may be significantly influenced by the specific geometry of the composite. In this work the nanostructure of interest is a mat of electrospun nanofibers with diameters of $\sim$100 nm and high porosity. To understand percolation within these mats, two series of Monte Carlo calculations are performed. The critical volume percent is investigated in continuous samples (purposefully non-complex structures) to determine the effect of sample size and shape; this is representative of the percolation in a single fiber. In addition, computational realizations of experimentally produced electrospun mats are tested for critical volume percentages; the aim being to establish which factors of the nanostructure influence the percolation process and how do these results compare to the continuous system.

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