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Dimensional Analysis of Percolation Theory: Applications to Polymer Composites DERRICK STEVENS, Dept. of Physics, North Carolina State University (NCSU), TORISSA HOFFMAN, Dept. of Physics, NCSU, RUSSELL GORGA, Dept. of Textiles Engineering, Chemistry and Science, NCSU, LAURA CLARK, Dept. of Physics, NCSU — Percolation theory is well known to describe functional phenomena in polymer composites such as electrical conductivity, when combining a conducting particle and insulating matrix. Nanostructured composites can, however, present unique morphologies that are not easily described by the typical one, two, or three-dimensional viewpoint. One example is random mats of polymer/carbon nanotube (or silver nanoparticle) composite nanofibers. With this motivation, Monte Carlo simulations were developed to investigate various effects within such a fibrous geometry, including changes to the critical volume fraction due to the dimensionality: particle aspect ratio, relative size of particle and fiber (or film), sample size, continuous vs. porous structure. From these simulations a model was developed to predict the percolation threshold based on the dimensionality of the system. The results of these simulations and the derived model will be presented.

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