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Multi-scale Real-Space Characterization of Carbon Nanofiber Composites BENJI MARUYAMA, Air Force Research Laboratory, Materials & Manufacturing Directorate, SIRINA PUTTHANARAT, University of Dayton Research Institute, LAWRENCE DRUMMY, RICHARD VAIA, JONATHAN SPOWART, AFRL, Materials & Manufacturing Directorate, CARLA LEER, FERRIE VAN HATTUM, University of Minho, Portugal — Good dispersion of the reinforcement phase in nanocomposites is recognized as critical to achieving material property goals. Hierarchical nanocomposite morphologies can be quantified by a combination of 1) Reciprocal space methods such as scattering, 2) Real space imaging such as AFM and TEM, and/or 3) Inference from established structure-property models. However, none of these techniques alone has proven satisfactory to quantitatively characterize nanocomposite morphologies across multiple length scales and link them to properties. Nor have they been adequate to define quality control metrics for dispersion. The current effort is devoted to characterizing dispersion in carbon nanofiber composites from the nano- to meso-scales (i.e., 10 nm - 10 mm) using the Multi-Scale Analysis of Area Fractions (MSAAF) technique of Spowart et al. This technique uses a fractal analysis of real space images to generate a homogeneous length scale (scale at which the statistical variability in concentration is at some threshold), and a fractal dimension characteristic of the dispersion over a wide range of length scales. This work is part of a larger effort to determine structure/property relations of complex materials systems.

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