Comparison of Two Models of SWCN Polymer Composites

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Abstract

Two approaches for predicting elastic properties of SWCN/polymer composites, equivalent-continuum modeling and the self-similar approach, are presented and compared in terms of assumptions and ranges of validity. Both models incorporate information about molecular interactions at the nanometer length scale into a continuum-mechanics based model. It is shown that the two approaches can predict elastic properties of SWCN/polymer composites in a combined range spanning dilute to hyper-concentrated SWCN volume fractions. In addition, the predicted Young’s moduli for a SWCN/polymer composite determined using both approaches are shown to be consistent.

Keywords: Carbon nanotubes, volume fraction, representative volume element, helical array, lattice dynamics, molecular mechanics, elastic properties.