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Carbon nanotubes and their applications in polymer composites

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Multiwalled carbon nanotubes (CNTs) are one of the extensively studied nanostructured materials because of their unique electrical, thermal, and mechanical properties. In particular, carbon nanotubes are unique and ideal to decorate various nanoparticles allowing the construction of designed nanoarchitectures that are extremely attractive as supports for heterogeneous catalysts, and multifunctional composite structural applications. This presentation will give you an overview of synthesis of metal and metal oxides such as silver (Ag), gold (Au), copper (Cu), diamond, titanium dioxide (TiO2) and zinc oxide (ZnO) nanoparticles coated CNTs using microwave and sonochemical methods. Pristine CNTs were synthesized using first nano-300 CVD technique and iron based metal catalyst. The as prepared hybrid nanoparticles were further infused into the nylon-6 or epoxy resin system using melt extrusion process or non-contact mixing process to produce hybrid nanoparticles based polymer nanocomposites. However, in fiber reinforced polymer nanocomposites one of the major disadvantages of nanofillers such as carbon nanotubes is the entanglement and agglomeration in the matrix. Improving poor dispersion and lack of alignment of carbon nanotubes in the matrix materials is a major challenge to the improved mechanical performance of nanocomposites and hybrid composites. To address some of these issues we have also *in-situ* grown CNTs on carbon fiber using catalytic chemical vapor deposition method. These CNTs grown carbon fabrics were further fabricated in to laminates using a well-known vacuum assisted resin transfer molding process. A two part (SC-780) epoxy resin was used as polymer matrix. These polymer nanocomposites were tested for their thermal, mechanical, and microscopic properties.

Biography

Vijaya K. Rangari is an associate Professor at Department of Materials Science and Engineering, Tuskegee University. His main research interests are: a) Synthesis of various types of nanoparticles with different surface chemistries, shapes and sizes using CVD, sonochemical and microwave techniques; and b) Alignment of acicular nanoparticles in polymeric fibers through single screw melts extrusion for multifunctional textile applications. c) Applications of magnetic and bio-based nanoparticles for medical applications. He has published about 77 research articles in reputed journals, 100 conference proceedings and 3 chapter books.

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