Using Design of Experiments to Understand Effects of Chemical and Plasma Functionalization on the Surface Tension of Carbon Nanotubes

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Abstract

Carbon nanotubes (CNTs) show a great potential for a wide range of products and applications. Oxidation of CNTs through plasma treatment has been shown to produce better dispersion and interfacial bonding. This report describes chemical and plasma functionalization of carbon nanotubes where different levels of oxidation were investigated using principles of experimental design. Results revealed that the samples reacted differently to the each degree of functionalization. In addition to, these studies provide a basis of common practices that have been experimented with and in some cases perfected for the treatment carbon nanotubes. The major areas addressed are the chemicals used, possible setups, industrial engineering tools and safety concerns all of which being critical considerations to creating an effective experiment. Finally, conclusions are drawn based upon the data that was gathered.

Keywords
Carbon nanotubes, Design of Experiments, Functionalization

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Richard Liang is a professor at Department of Industrial and Manufacturing, Florida State University. He also serves as the Director of the FSU High-Performance Materials Institute (HPMI). He received his PhD degree in Materials Science and Engineering from the Beijing University of Aeronautics and Astronautics. He is research experience and expertise are in the areas of advanced composites, multifunctional nanomaterials and CNT buckypaper materials, including synthesis, chemical functionalization, processing-structure-property relationships, and multiscale characterization and manufacturing process modeling.