Chemically Functionalized Carbon Nanotubes Deposited at the Polymer-Fiber Interface for Maximum Reinforcement Efficiency in Fiber-Reinforced Polymeric Composites

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Fiber-reinforced polymeric composites (FRPC) are great engineering materials that are currently used in a wide variety of applications including aerospace, transportation, construction, marine goods and sporting goods. However, FRPC materials are still susceptible to failures primarily due to poor interfacial interactions between polymer matrix and the fiber in FRPCs. In this study, the polymer-fiber interface of FRPCs was tailored with novel carbon nanotube (CNT) structures in an effort to dramatically improve their mechanical performance. For this purpose, chemically functionalized multi-walled carbon nanotubes (MWCNTs) were uniformly incorporated into the polymer-fiber interface using a novel electrospray deposition method. Resulting composite structures containing as low as 0.01 wt% MWCNTs showed up to 20% improvement in key mechanical properties such as the interlaminar shear strength and flexural strength in this study, which was found to be one of the unique examples in the literature in terms of the overall reinforcement efficiency (incorporated CNT content vs. degree of property improvement). The presentation will focus on the preparation of chemically functional MWCNTs, their electrospray deposition and characterization of manufactured FPRCs.

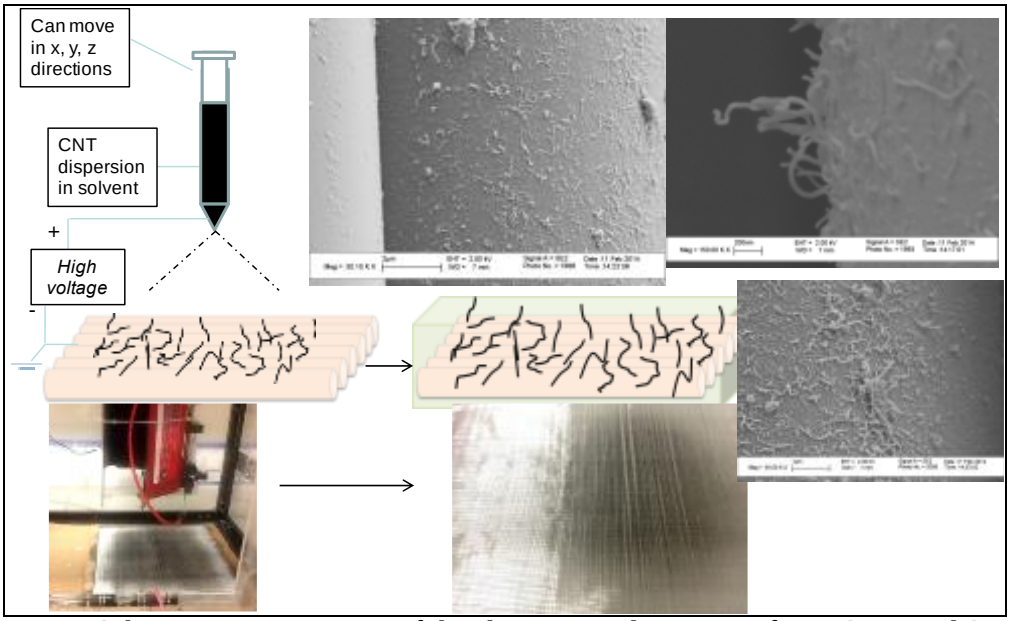

Figure 1: Schematic representation of the electrospray deposition of MWCNTs and SEM images of MWCNT coated fiber mat surface

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