NOVEL POLYELECTROLYTE COMPLEX BASED CARBON NANOTUBE COMPOSITE ARCHITECTURES

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ABSTRACT

This study focuses on creating novel architectures of carbon nanotubes using polyelectrolytes. Polyelectrolytes are unique polymers possessing resident charges on the macromolecular chains. This property, along with their biocompatibility (true for most polymers used in this study) makes them ideal candidates for a variety of applications such as membranes, drug delivery systems, scaffold materials etc.

Carbon nanotubes are also unique one-dimensional nanoscale materials that possess excellent electrical, mechanical and thermal properties owing to their small size, high aspect ratio, graphitic structure and strength arising from purely covalent bonds in the molecular structure. The present study tries to investigate the synthesis processes and material properties of carbon nanotube composites comprising of polyelectrolyte complexes. Carbon nanotubes are dispersed in a polyelectrolyte and are induced into taking part in a complexation process with two oppositely charged polyelectrolytes. The resulting stoichiometric precipitate is then drawn into fiber form and dried as such. The material properties of the carbon nanotube fibers were characterized and related to synthesis parameters and material interactions. Also, an effort was made to understand and predict fiber morphology resulting from the complexation and drawing process.

The study helps to delineate the synthesis and properties of the said polyelectrolyte complex-carbon nanotube architectures and highlights useful properties, such as electrical conductivity and mechanical strength, which could make these structures promising candidates for a variety of applications.