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Biocompatible Individual Dispersion of Single-walled Carbon Nanotubes

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Dispersion of carbon nanotubes in biocompatible media are of particular interest for diverse biomedical and nanomedicine applications. Various biomolecules and biopolymers such as DNA, proteins, poly L-lysine, starch, gelatin, steroid biosurfactants, and chitosan have shown capability for the effective dispersion of carbon nanotubes in water. Chitosan has demonstrated capacity for effective dispersion of single-walled carbon nanotubes (SWCNTs) in acidic medium and it also showed tendency to preferentially disperse smaller diameter nanotubes. Chemical functionalizations of chitosan enable its solubility in neutral pH water by reducing the intra and inter molecular hydrogen bonding. Herein, we present a neutral pH water soluble chitosan derivative, chitosan-hydroxyphenyl acetamide (CHPA), obtained by functionalizing the amino groups of chitosan with 4-hydroxyphenyl acetic acid, as an efficient biocompatible dispersant for debundling and solubilization of SWNTs in neutral aqueous solutions. Various process conditions for individual dispersion of SWCNTs are analyzed based on optical absorption and Raman spectroscopy.

Keywords: Single-walled carbon nanotube, Chitosan derivative, Biocompatible dispersant, Individual dispersion