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Temperature Tailored Dispersion of Carbon Nanotubes in Water[1]

KRISHNA ETIKA, Texas A&M Univeristy, FLORIAN JOCHUM, PATRICK THEATO, University of Mainz, JAIME GRUNLAN, Texas A&M University — Despite their immense potential, the ability to control the dispersion and microstructure of carbon nanotubes remains a hurdle for their widespread use. Stimuli-responsive polymers show conformation changes with applied external stimulus (pH, temperature, light etc.). Temperature responsive polymers based on poly(N-cyclopropylacrylamide) [p-PNCPA], with varying amounts of pyrene functionality, were used to disperse carbon nanotubes in water. Cryo-TEM micrographs show that SWNTs stabilized using p-PNCPA exists in an exfoliated and bundled state below and above the lower critical solution temperature (LCST) of the polymer, respectively. Viscosity measurements on SWNT/p-PNCPA aqueous suspensions show a shear thinning and nearly Newtonian behavior at temperatures below and above LCST of the polymer, respectively. Studies performed on the SWNT/p-PNCPA composites suggests that microstructure of SWNTs in the suspensions is preserved in the solid composite, as evidenced by SEM imaging and electrical conductivity measurements.

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