Mitigation of the Cytotoxicity of Single-walled Carbon Nanotubes Using Nontoxic Surfactants and Surface Functionalization

Elsishans, Rebecca

This research sought to address the toxicity of carbon nanotubes (CNTs) when released into the environment through the addition of nontoxic surfactants and the novel method of surface functionalization. It is important that the toxicity of CNTs be understood because as their usage increases, the likelihood of their release also increases. This can have direct negative effects on the health of both terrestrial and aquatic organisms, including humans. In testing how the two methods would affect toxicity, it was predicted that both methods would decrease cytotoxicity, but that the surfactant suspension method would be more effective. The effects at different concentrations of each nanotube treatment were tested on the growth rate of P. subcapitata (a freshwater algae) and the oxidative stress of E. coli. While both methods decreased toxicity, the novel method of surface functionalization significantly outperformed the use of surfactants. This was shown by an average decrease in toxicity of 55% and 20% on P. subcapitata and E. coli, respectively, when functionalization was used instead of surfactants. Based on these findings, it is suggested that surface functionalization of CNTs should be implemented when risk of environmental contamination is apparent.

Awards Won: