Environmental Detection of Single-Walled Carbon Nanotubes Utilizing Near-Infrared Fluorescence.

Tremaine Powell and Dermont Bouchard

US Environmental Protection Agency, National Exposure Research Laboratory, Athens GA, 30605, USA

There are a growing number of applications for carbon nanotubes (CNT) in modern technologies and, subsequently, growth in production of CNT has expanded rapidly. Single-walled CNT (SWCNT) consist of a graphene sheet rolled up into a tube. With growing manufacture and use, the potential for unintended release of CNT into the environment increases. However, many of the characterization techniques used for other colloidal nanoparticles are not as reliable for CNT due to their one-dimensional structure. Methods such as total organic carbon (TOC) analysis can provide nonspecific detection of CNT; however, a more specific quantitative method is needed. SWCNT commonly have diameters of ~1 nm, and exhibit specific fluorescence signals in the near- infrared (NIR) range. Here we report on the utilization of NIR fluorescence spectroscopy (NIRFS) for detecting and quantifying SWCNT in aqueous media and adhered to solid surfaces. SWCNT were dispersed in sodium dodecylsulfate and ultrasonicated to obtain non-aggregated tubes in suspension. The SWCNT suspension was then exposed to p-doped silicon (Si), and nanotubes bound electrostatically to the Si were detected using NIRFS.

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Powell, Tremaine B.
EPA ERD NERL
960 College Station Rd.
Athens, GA 30605
706.355.8313
powell.tremaine@epa.gov

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