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# Functionalization and Length Fractionation of Single-Wall Carbon Nanotubes

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## ABSTRACT

Single-wall carbon nanotubes (SWCNTs) are a promising material for future biological applications such as imaging and targeted drug delivery. SWCNTs can be made soluble in water through surface functionalization, a priority for their use in biology. By studying the surface chemistry of SWCNTs, various functionalization methods can be accomplished without perturbing their electronic structure. This study probes the use of pyrene derivatives and phospholipids to non-covalently functionalize SWCNTs, maintaining useful surface properties. Phospholipids cross-linked to polyethylene glycol (PEG) or 1-pyrenebutyric acid conjugated to DNA is anchored onto the sidewalls of SWCNTs by hydrophobic interactions or π-stacking. The PEG/DNA portion is water soluble and biocompatible, thus solubilizing the SWCNTs. Biofunctional materials such as DNA or proteins can be attached to the functionalized nanotubes and used for biological applications. Functionalization is characterized by optical methods and atomic force microscopy (AFM). Length sorting of SWCNTs fit for use in bio-functionalization is also explored. By functionalizing SWCNTs with groups that are cytologically compatible, allowing for their dispersion in water, they show greater promise in future biological applications.

## KEYWORDS

Carbon nanotubes, surface chemistry, lipids, pyrene, DNA

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