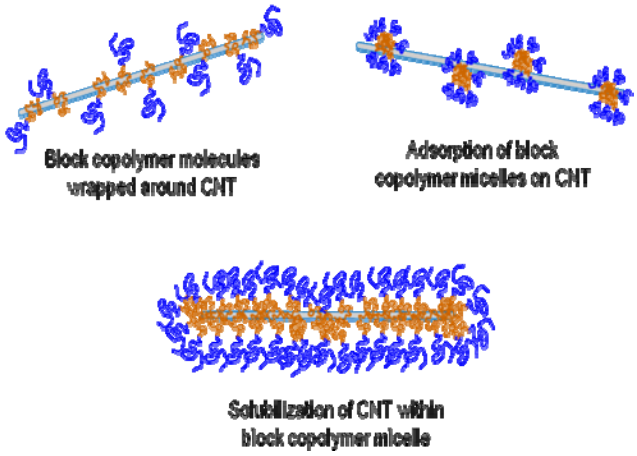
Thermodynamically Stable, Size-Selective Solubilization of Carbon Nanotubes

A new mode of molecular interaction is proposed, wherein the block copolymer molecules self-assemble around the nanotube to generate a thermodynamically stable aqueous dispersion. Molecular interactions based on micellar solubilization correspond to a thermodynamically stable dispersion of carbon nanotubes in the solvent medium. Such a phenomenon of micellar solubilization of nanotubes was examined using a phenomenological theory for the free energy change on solubilization. Illustrative calculations performed for symmetric PEO-PPO-PEO triblock copolymers showed that block copolymer molecules are capable of solubilizing the carbon nanotubes in aqueous solutions. While the block copolymer molecules that spontaneously form cylindrical micelles are most likely to solubilize the nanotubes, other copolymers whose natural curvature is spherical or lamellar also are capable of forming cylindrical micelles around the nanotubes. Most interestingly, the solubilization is found to be size specific suggesting that this can be developed into a practical method to fractionate carbon nanotubes by size or chirality. This research was presented at the 2008 Fall ACS National Meeting at Philadelphia.



Reference/Publication

"Molecular Assembly between block copolymers aggregating as cylindrical micelles and single wall carbon nanotubes in aqueous solutions," 236th ACS National Meeting, Philadelphia, PA, 17 August, 2008

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