

Surface Modification and Solubilization of Single-walled Carbon Nanotubes in Water with π -Aromatic Compounds

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Carbon nanotubes have been in the forefront of nanoscience and nanotechnology because of their many unique properties. Very recently, considerable attention has focused on the preparation of soluble carbon nanotubes that would find many chemical applications in fundamental and practical research fields[1]. Carbon nanotubes have been reported to be soluble in the aqueous micellar solution of some detergents [2] and in the aqueous solutions of polymers [3]. Here we designed and synthesized pyrene-carrying water soluble compounds including polymers **1-4** as solubilizers, since the pyrene moiety has been reported to have affinity with carbon nanotubes[4]. Such π -aromatic water soluble compounds are expected to solubilize carbon nanotubes in water via π - π interactions between the side-wall of nanotubes and the aromatic moiety of the solubilizers (Fig. 1).

The purified SWNTs was placed in 20 mL of an aqueous solution of **1** (1 mM) and then the mixture was ultrasonicated for 1 h with a bath-type sonicator, followed by centrifugation to give a black-colored transparent supernatant aqueous dispersion/solution[5]. TEM measurements for the aqueous dispersion of p-SWNTs-**1** were conducted on a Jeol JEM-100S

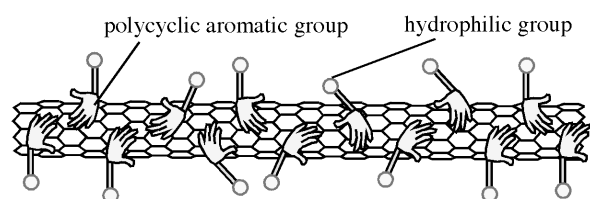


Fig. 1. A cartoon for the solubilization of a SWNT in water with an water-soluble amphiphile bearing a polycyclic aromatic group.

electron microscope. A carbon-coated TEM grid (Ouken-Shoji, 200-A mesh) was immersed in the dispersion/solution for 0.5 h, followed by air-drying. Figure 2 shows a typical TEM image, in which dispersed bundled SWNTs with molecular length of ~ 0.7 - ~ 3 μm are observed. It is in fact that the water solution/dispersion contains the nanotubes.

Compounds **2-4** also dissolved/dispersed SWNTs in water by a similar way. Detailed will be reported at the meeting.

References

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