

Magnetic nanoparticle-based separation of metallic and semiconducting carbon nanotubes

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Abstract

We report a simple and scalable method for the separation of semiconducting single-walled carbon nanotubes (SWNTs) from metallic SWNTs using magnetic nanoparticles (MNPs) functionalized with polycationic tri-aminated polysorbate 80 (TP80). MNPs–TP80 are selectively adsorbed on acid-treated semiconducting SWNTs, which makes the semiconducting SWNTs be highly concentrated to over 95% under a magnetic field. Almost all the field effect transistor network devices, which were fabricated using separated semiconducting SWNTs, exhibited a p-type semiconducting behavior with an on/off ratio of higher than 10^4 .

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