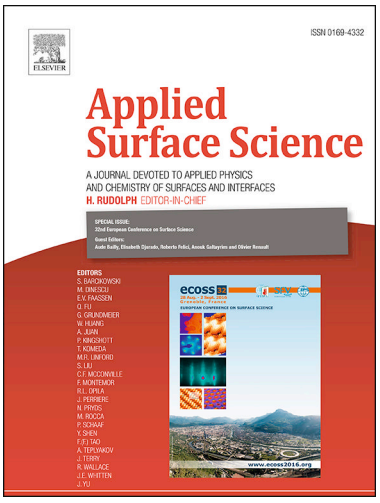

Full Length Article

Thiol functionalized carbon nanotubes: synthesis by sulfur chemistry and their multi-purpose applications

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Thiol functionalized carbon nanotubes: synthesis by sulfur chemistry and their multi-purpose applications

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Abstract: A facile and scalable method for the preparation of thiol functionalized carbon nanotube (SH-CNT) is reported here by sulfur chemistry. In this strategy, the ring-opening of elemental sulfur (S_8) was triggered by UV irradiation to generate polysulfide diradicals, which were then attached on tube walls through free radical addition. After reductive cleavage of the multi-sulfide bonds by $NaBH_4$, SH-CNT was obtained. The chemical and structural characteristics of SH-CNT were investigated using Raman spectroscopy, Fourier transform infrared spectroscopy, thermogravimetric analysis, X-ray photoelectron spectroscopy and transmission electron microscopy. The results demonstrated the successful introduction of thiol groups on tube walls with limited damages to conjugated framework of CNT. The versatility of thiol groups allowed post functionalization of SH-CNT through thiol-ene, thiol-epoxy click chemistry, and thiol-thiol redox reaction as demonstrated in this paper. In addition, it is also showed here that SH-CNT was good reinforcement agent for epoxy resins because of the established strong covalent interfacial interactions between thiol and epoxy groups.

Keywords: Carbon Nanotube; Thiol groups; Elemental sulfur; Functionalization