

Surface properties transformation of multi-walled carbon nanotubes on treatment with various acids.

ABSTRACT

Multi-walled carbon nanotubes (MWCNTs) were treated with various acids namely nitric, citric, chromic and a mixture of nitric-sulphuric acids to introduce carboxylic acid functional groups on them. As a result of this treatment, carboxylic functional groups were found to exist as indicated by Fourier transformed infrared spectroscopy (FTIR) study. Breunauer-Emmet-Teller (BET) specific surface area of the resulting samples was found to be 98, 133, 167 and 247 m²/g for the sample treated with a mixture of nitric and sulfuric, citric acid, chromic acid and nitric acid respectively. Compared to the specific surface area of 1210 m²/g for the starting MWCNTs, this is equivalent to percentage reduction of 91.8, 89.0, 86.2 and 79.6 % respectively. The crystallinity of the samples increased when nitric and a mixture of nitric and sulphuric acids were used for the treatment, but decreased when citric or chromic acid were used, as observed by X-ray diffraction (XRD) study. Except for the MWCNTs treated with nitric acid, diameter expansion was observed for all the samples.

Keyword: Surface Properties; Multi-Walled carbon nanotubes; Treatment; Acids; Functional group; Surface area; Surface modification.