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# Thermal stability investigation of decorated multi wall carbon nano tubes (MWCNT) with $TiO_2$ nanoparticles

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**Abstract**
The aim of the current research is concentrated on the modification of multi-walled carbon nanotubes (MWCNT) using $TiO_2$ nanoparticles at rutile phase. In order to elucidate the role of $TiO_2$ content on photocatalyst behavior of MWCNTs, the hybrids were prepared with different amounts of $TiO_2$ nanoparticles. the opening and functionalization of MWCNTs were carried out by oxidation with nitric acid solution. The samples were characterized by Fourier Transform infrared (FT-IR) spectroscopy, transmission electron microscopy (TEM), and thermogravimetric analysis (TGA). FTIR results show that functional groups such as carboxylic and hydroxyl groups have been successfully attached to the surface of nanotubes after acid treatment. The attaching these oxygen containing groups lead to easy dispersion of CNTs in polar solution. TEM results of oxidized MWCNTs illustrated opening of MWCNTs at the end tips. The micrographs taken from the modified carbon nanotubes prove that the surface of MWCNTs is decorated with nano-sized $TiO_2$. The TEM results revealed that the average size of $TiO_2$ nanoparticles which modified MWCNTs were 20nm. TGA results confermed that there was no obvious weight loss between 300 and 400°C, therefore there is no amorphous carbons in the raw samples The results obtained from thermal behavior of modified CNTs revealed that the hybrid with highest amount of $TiO_2$ had the higher temperature of decomposition.

**Keywords:** Physical behavior, MWCNT, $TiO_2$, Thermal stability

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