Synthesis and Hydrogen Storage Performance of Al_2O_3 Nanoparticle Decorated Functionalized Multi-Walled Carbon Nanotubes (Al_2O_3@f-MWCNTs)

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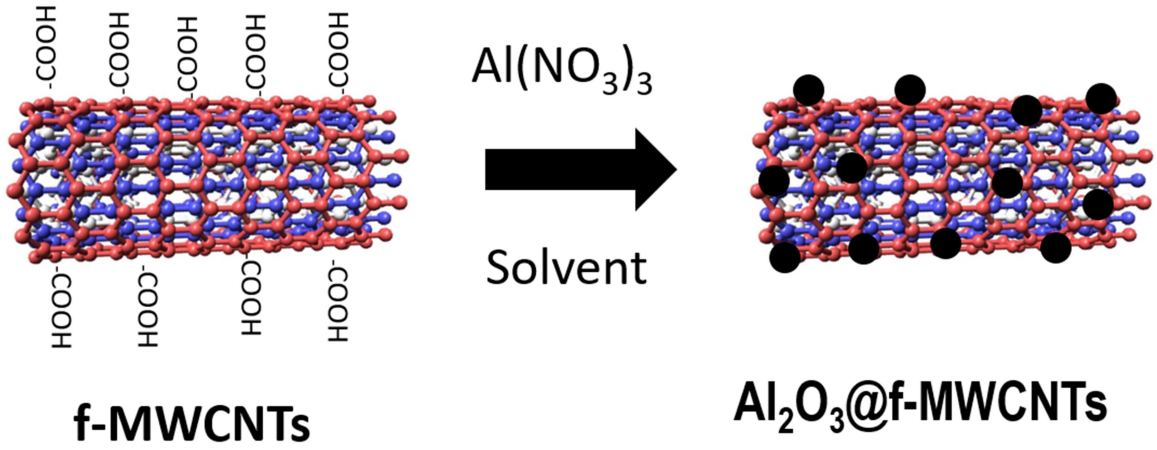

Abstract:

Al_2O_3 nanoparticle decorated functionalized Multi-Walled Carbon Nanotubes (Al_2O_3@f-MWCNTs) have been synthesizedto examine the hydrogen storage performance at non-cryogenic temperatures and moderate pressures for green energy applications. The experimental conditions such as solvent medium and metal content have been tuned to improve the decoration of Al_2O_3 nanoparticles on the surface of carboxylate-functionalized multi-walled carbon nanotubes (COOH-MWCNTs/f-MWCNTs). The morphology, surface properties and structure of compounds were characterized by Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), FT-IR and powder X-ray diffraction. The hydrogen uptake of materials was examined by High Pressure Gas Adsorption System at non-cryogenic temperatures i.e. 253 K and 298 K up to 70 bar pressure. Al_2O_3@f-MWCNTs prepared in water, triethylamine and DMF adsorbed 0.46, 0.55 and 0.67 wt% of hydrogen at 253 K and 0.17, 0.31 and 0.46 wt% of hydrogen at 298 K, respectively. The higher uptake of hydrogen by Al_2O_3@f-MWCNTs prepared in DMF is due to uniform loading ofmetal nanoparticles on the surface of carbon nanotubes.

Keywords: Functionalization; P-MWCNTs;f-MWCNTs;Al_2O_3 nanoparticles; hydrogen storage.