HYDROGEN STORAGE IN SINGLE WALL CARBON NANOTUBES PRODUCED ON IRON CATALYST

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Hydrogen is a promising clean energy alternative to conventional energy sources. Hence, increasing demand on hydrogen as energy carrier enhances studies in hydrogen storage. Hydrogen should be safely and efficiently stored in order to overcome existing barriers in hydrogen usage. Single wall carbon nanotube (SWCNT) is an eligible material for hydrogen storage. In this study, SWCNTs were produced by catalytic chemical vapor deposition (CCVD) of acetylene (C_2H_2) on MgO powder substrate impregnated with Fe. Catalysts were prepared with Fe to MgO ratio of 5:100 using iron nitrate ($Fe(NO_3)_3 \bullet 9H_2O$) solution as Fe source. SWCNTs were synthesized at 800°C for 60 minutes. Nitric acid (HNO3), was used for purification of synthesized SWCNT. The aim of the research was to investigate hydrogen storage capacity of as produced and purified SWCNTs synthesized on Fe-MgO catalyst. The morphology and structure of the SWCNTs were characterized by transmission electron microscope (TEM), scanning electron microscope (SEM) and X-ray diffraction (XRD) analysis. Thermal gravimetric analysis (TGA), and Raman spectroscopy were used for further characterization. Hydrogen storage capacities of SWCNTs were measured by high pressure volumetric analyzer using volumetric method at the cryogenic temperature and gas pressure up to 90 bar. It was found that the hydrogen adsorption capacities of these materials were around 1.9 and 5.3 wt% for as produced and purified SWCNTs respectively. With the fact that DOE target for 2015 is 5.5 wt%, it was seen that SWCNTs produced on Fe-MgO catalyst have good potential as hydrogen storage material.