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Hydrogen Adsorption Capacity Of Multiwalled Carbon Nanotubes Grown Over Different Catalyst Supports
(135)

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Abstract

Multiwalled Carbon Nanotubes (MWNTs) have been synthesized using the catalytic chemical vapour deposition (CCVD) method. The effect of hydrogen adsorption capacity on the types of support used to grow the MWNTs has been studied. Aluminium oxides (Al_2O_3) and molecular sieves (MS) have been used as support in the synthesis of carbon nanotubes (CNTs). The catalysts used for the growth of the MWNTs were mixtures of iron and cobalt. The supported catalysts were prepared by the impregnation method. The carbon source was acetylene mixed with an inert gas, nitrogen. The gas source was passed over the catalysts at temperatures between 600-800°C and carbon nanotubes were collected as black powder on the catalysts. The MWNTs produced were then characterized for their purity through FE-SEM and TEM. The as-grown MWNTs were found to be 90 % high in purity. Results obtained showed that CNTs with different diameter sizes and forms were produced from these types of supported catalysts. A simple hydrogen adsorption measurement system utilizing the volumetric differential pressure technique has been designed, fabricated and calibrated. Hydrogen adsorption measurements have been carried out at 298K with MWNTs having different surface areas. The study indicated that the amount of H_2 adsorbed is affected by the types of carbon nanotubes as well as the catalysts and supports used for the synthesis. However, the as-grown MWNT with the alumina support showed the highest amount of hydrogen adsorbed because of a larger surface area. There is also a correlation between the amounts of hydrogen adsorbed and the surface area of the CNTs under the conditions studied. The adsorption data obtained will be helpful in understanding the adsorption property of the studied carbon materials using the fundamentals of adsorption theory.