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Synthesis and application of carbon nanotubes

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Carbon nanotubes are thecompounds most studied in the last twenty four years.Their unique properties, such as high electrical conductivity, high surface area, amazing mechanical strength, and many specific properties make it suitable for many applications in many fields of nanotechnology. Carbon nanotubes can be defined as a rolled -up graphene sheet that forms long concentric cylinders consisting of carbon atoms with bond between carbon atoms essentially SP2. The properties of this structure depend on many parameters such as morphology, diameter, structure, and length. There are two types of carbon nanotubes, which are single wall carbon nanotubes (SWNT) and multi wall carbon nanotubes (MWNT). The MWNTs are concentric of SWNTs, which are held together by Van der Waals bonding. Carbon nanotubes can be also classified according to chirality of carbon atomsArmchair, Zig-Zagand Chiral.The project consist of three sections: the first section deals with the synthesis of carbon nanotubes by using chemical vapor deposition (CVD) from natural sources (date palmand seeds), and applying some methods and changing the parameter to increase the ratio of products. This part include synthesis binary and ternary composite, the first type consist of carbon nanotubes (SWNT and MWNT) with semiconductors (TiO_2), and also titanium dioxide with different metals (Pt, Au, Pd, Ru, Rh). Binary and ternary composites (M/CNT/TiO_2) include metal, titanium dioxide, and single or multi wall carbon nanotubes in different ratio. The second part of the work is the characterization for the products by using Raman spectroscopy, XRD, SEM, TEM, FT-IR, BET and band gap determination by using UV-visible reflectance.This section also include electric analysis studies to determine the band gap for some of them by usingMott-Schottky method and Cyclic Voltomatric to get more clear images for these composites. The third section includes the applications of prepared composites. The activity of synthesized composites towards removing pollutant by photocatalytic degradation reaction (binary and ternary composite), and adsorption process (bare MWNT) were followed. Hydrogenation production was also tested for binary and ternary composite by using methanol/water mixture.The results show that SWNT was more active to enhance the activity of titanium dioxide in the two processes (photocatalytic degradation and hydrogen production) as compared with MWNT. The enhancement was tested with M/TiO_2 which shows increase in activity when SWNT was added to this composite as compared to when MWNT was added.

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