Comparison of Structural and Electrochemical Properties of Doped and Superficially Modified Multiwall Carbon Nanotubes

E. Samaniego Benitez[1], R. Fernández Loyola[1], E. Flores Rojas[2], J. F. Pérez Robles[1], O. Solorza Feria[2],

[1]Centro de Investigación y Estudios Avanzados del IPN unidad Querétaro; Libramiento Norponiente #2000; Fracc. Real de Juriquilla; C.P. 76230; Queretaro Mexico
[2]Centro de Investigacion y Estudios Avanzados del IPN unidad Zacatenco; Av. Instituto Politécnico Nacional No. 2508, Colonia San Pedro Zacatenco, CP 07360, Ciudad de México D.F., México.
*Tel: +529831566032; e-mail: esamaniego@qro.cinvestav.mx

ABSTRACT

One of the most active fields of research is currently the synthesis, characterization and application of carbon nanotubes (Carbon Nanotubes: CNTs). In the particular case of the family of technologies related to hydrogen, CNTs and proton exchange membranes are candidates for improving the performance of fuel cells, as well as to resolve many of the difficulties related to the storage of hydrogen. In this work the structural and electrochemical differences of both doped CNT's and superficially modified with transition metals was studied. The CNT's used in this work were produced by the chemical vapor deposition (CVD) process and purified by an acid route. The structural properties were studied by Raman spectroscopy to determine the purity of the material. Scanning and transmission electron microscopy were used to characterize the morphology of the samples. The chemical composition was determined by Inductively Coupled Plasma Mass Spectrometry with which it was possible to determine the amount of dopant metal of the samples. Cyclic voltammetry and chronoamperometry in acid medium were used to determine the electrochemical behavior and stability of the samples respectively. A great number of imperfections were determined in the doped samples compared with a sample of pure CNT. The study of the morphology showed the presence of the tubular structure characteristic CNT's in all samples. The study showed that electrochemical AACVD sample exhibits better electrochemical activity as well as a higher stability despite having a lower amount of doping material compared to the other two samples.

Keywords: Carbon Nanotubes; doping; electrochemical