SYNTHESIS AND CHARACTERIZATION OF COMPOSITES BASED ON CARBON NANOTUBES AND NATURAL OR SYNTHETIC Porphyrins

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In this study, the covalent and noncovalent functionalization of carbon nanotubes with porphyrins coming from different sources is reported. For the synthesis of the nanotube-porphyrin compounds, three kinds of multiwalled carbon nanotubes were used: pristine, acid functionalized, and doped with nitrogen. Carbon nanotubes were mixed with three kinds of porphyrin like compounds, two of them, chlorophyllide and pheoporbide coming from Sea Hibiscus leaves (Hibiscus tiliaceus), and the third was the commercial and synthetic protoporphyrin IX. The characterization was done using infrared, Raman, and UV-visible spectroscopies as well as fluorescence emission spectroscopy. The analysis of the conformation of the compound materials was done by atomic force microscopy and field emission scanning electron microscopy. Several degrees of interaction between nanotubes and porphyrins were observed. Regarding the nanotubes, it was observed an increasing interaction in the order: doped nanotubes, pristine and functionalized. Images recorded from scanning electron microscopy revealed differences between bare nanotubes and the compound materials, changes in the average diameter of nanotubes after mixing both materials were observed. It was noteworthy that there were stronger interactions in the compounds prepared using porphyrins coming from Sea Hibiscus than in the compounds elaborated using synthetic porphyrin.

**Keywords:** Carbon nanotubes, natural porphyrins, synthetic porphyrins

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