Abstract

Currently carbon nanotubes are considered as new alternative and efficient tools for biological applications, especially for transporting therapeutic molecules. However, pristine CNTs are completely insoluble in all solvents and this will be a hindrance for their biological applications; consequently, functionalization of these nanostructures is a key step towards their technological applications, as it can improve substantially their solubility and biocompatibility profile; for this purpose, in this study, we first report two functionalization approaches which are widely employed for modification of CNTs: Amino-functionalized and Carboxyl-functionalized nanotubes. FTIR results prove the functional groups introduced by these reactions to CNx MWNT. Results show three types of functional groups on the CNx MWNT: hydroxyl groups (3429 cm⁻¹), carboxyl groups (1714 cm⁻¹), and carbonyl groups (1571). In the FTIR spectrum of the oxidized CNTs, the peak at ~1714 cm⁻¹ is attributed to the C=O stretch of the carboxylic group (Carboxyl-functionalized).

Because these functionalized carbon nanotubes display low toxicity and are not immunogenic, and also are able to cross the cell membrane, they will be further used to deliver their cargos to cells and organs. Following this goal, we chose amphotericinB (AmB) as a drug. AmB is considered to be the most effective antibiotic in the treatment of chronic fungal infections. However, the drug is highly toxic to mammalian cells. Since functionalized CNTs display low toxicity and are not immunogenic, we coupled f-CNTs to AmB in order to improve the efficacy of this drug. The introduction of AmB to CNTs has clearly been confirmed through UV/Vis Spectrum measurements.

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