

# Jordan University of Science and Technology

## Removal of Nickel Ions from Water by Multi-Walled Carbon Nanotubes

**Authors:** Munther Issa Kandah and Jean-Luc Meunier

**Abstract:** Multi-walled carbon nanotubes (MWCNTs) were produced by chemical vapor decomposition using acetylene gas in the presence of Ferrocene catalyst at 800 °C, and then oxidized with concentrated nitric acid at 150 °C. Both (as-produced and oxidized) CNTs were characterized by TEM, Boehm titration, N<sub>2</sub>-BET and cation exchange capacity techniques. The adsorption capacity for nickel ions from aqueous solutions increased significantly onto the surface of the oxidized CNTs compared to that on the as-produced CNTs. The effects of adsorption time, solution pH and initial nickel ions concentrations on the adsorption uptake of Ni<sup>2+</sup> for both the as-produced and oxidized CNTs were investigated at room temperature. Both Langmuir and Freundlich isotherm models match the experimental data very well. According to the Langmuir model the maximum nickel ions adsorption uptake onto the as-produced and oxidized CNTs were determined as 18.083 and 49.261 mg/g, respectively. Our results showed that CNTs can be used as an effective Ni<sup>2+</sup> adsorbent due to the high adsorption capacity as well as the short adsorption time needed to achieve equilibrium.