Title: Adsorption Isotherm of Iron And Manganese from Pharmaceutical Wastewater By Polyethylene Glycol-Functionalized Carbon Nanoadsorbent

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Abstract: Carbon nanotubes (CNTs) were produced by catalytic vapour deposition (CVD) and purified via acid treatment method. The purified CNTs were functionalized with polyethylene glycol to give CNTs/PEG composite. The CNTs/PEG composite was then heat treated at 25 °C for 18 hours. The developed composite was characterized by High Resolution Transmission Electron Microscope (HRTEM), Brunnauer Emmett Teller (BET), Thermogravimetry Analysis (TGA) and Fourier Transform Infrared (FTIR) respectively to determine the particles nanostructures, surface area, thermal stability and functional groups. The developed CNTs/PEG was used as an adsorbent to remove iron and manganese from pharmaceutical wastewater via batch adsorption process. The influence of contact time, dosage, and temperature on the removal efficiency of the two metals was investigated. Results of analysis showed that the CNTs/PEG composite produced is thermally stable, highly crystalline with specific surface area of 970.805 m^2/g. The batch adsorption studies revealed that the optimum conditions to achieve 97.72 % were contact time of 60 minutes, adsorbent dosage of 0.3 mg and temperature of 50 °C. CNTs/PEG nanoasdsorbent showed greater affinity foe manganese than for iron. Freundlich model and the pseudo-second order model best described the adsorption isotherm and adsorption kinetics. The thermodynamic data showed that the adsorption process was endothermic and spontaneous. This study demonstrated that the CNTs/PEG composite is a promising surface modified surface modified nanoadsorbent for the treatment of pharmaceutical effluents.

Keywords: Carbon nanotubes, Polyethylene glycol, Functionalized carbon nanotubes, Adsorption

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