

Adsorption of Nonylphenol to Multi-Walled Carbon Nanotubes: Kinetics and Isotherm Study

Abstract

We explored the occurrence and distribution of nonylphenol (NP) in 13 Taiwanese source waters. From all the surveyed waters, NP was detected at a high concentration, which could be attributed to contamination by wastewater discharges. In this study, we applied modified multi-walled carbon nanotubes (MWCNTs) for removing NP from aqueous solution. The impact of a few experimental factors, i.e., pH, contact time, MWCNTs dose, and temperature on the NP removal efficiency of modified MWCNTs was studied. The maximum adsorption capacity of the MWCNTs was observed to be 1040 mg NP/g when the initial NP concentration was 2.5 mg/L, and the solution pH was 4. The adsorption process followed the Elovich kinetics and the Elovich isotherm, indicating it is multilayer adsorption. The thermodynamic analysis demonstrated the NP adsorption by MWCNTs was thermodynamically satisfactory and, for the most part, endothermic as in the case of phenol adsorption. The result of the current study demonstrated the significance of free binding sites and the pore size of MWCNTs in the NP adsorption. This paper will help to better comprehend the adsorption behavior and mechanism of alkyl phenolic compounds onto MWCNTs.