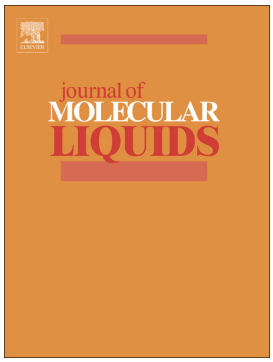

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Removal of 4-chlorophenol from water using different carbon nanostructures: A comparison study

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Abstract

In this research, performance of different carbon structures including multiwalled carbon nanotubes (MWNT), single walled carbon nanotubes (SWNT), carbon nanofibers (CNF), nano carbon (NC), nanoporous graphene (G) and mesoporous carbon (CMK) was studied as sorbents for removal of 4-chlorophenol (4-CP) from water. Nanostructures were synthesized and their morphologies studied by Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM). The structure and surface properties of carbon nanostructures were characterized using XRD, BET and Raman spectrometry. In several batch adsorption experiments, the effect of main factors including pH, temperature, time, and pollutant concentration on the adsorption of 4-chlorophenol as a chlorinated organic compound has been investigated. The results revealed proper consistency of adsorption data with Freundlich and Langmuir adsorption isotherms. For all nanostructures, the pseudo-second-order model was the most suitable model to describe the adsorption kinetics. Furthermore, thermodynamic parameters related to each sorbent were calculated and compared. Finally the sorbents were compared according to results of regeneration-reuse cycles. The optimum pH for 4-CP removal was obtained to be 5.0-7.0. The obtained equilibrium adsorption capacities were in the range of 58.82 to 334.34 mg g^{-1} for various nanostructures due to their different surface properties.