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Phosphate removal from aqueous solutions using magnetic multi-walled carbon nanotube; optimization by response surface methodology

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ABSTRACT

This work presents the application of magnetic multi-walled carbon nanotubes (MMWCNTs) for the removal of phosphate from aqueous solutions. Prepared nanoparticles were characterized by TEM, FTIR, VSM, and XRD measurements. The prepared magnetic adsorbent can be well dispersed in the aqueous solutions and quickly separated from the medium after loading on the adsorbent by a magnet. The application of response surface methodology (RSM) was investigated for optimizing the removal of phosphate from aqueous solutions using MMWCNTs. The effects of D/C (adsorbent dosage per initial concentration of pollutant ((mg) $_{adsorbent}$/(mg/l) $_{initial}$) and initial pH on phosphate removal (%) evaluated by RSM. Using RSM methodology, a quadratic polynomial equation was used for the removal of phosphate by multiple regression analysis. The optimum removal of phosphate was 97.35% at pH = 4 and D/C = 2.50. The experimental data were analyzed by the Langmuir and Freundlich adsorption models. The Maximum adsorption capacity for phosphate removal was obtained as 256 mg·g^{-1} from the Langmuir is other mmodel. The present work indicates the novel nature of the MMWCNT, which can remove the phosphates from the water.

Keywords: Phosphate removal; Multi-walled carbon nanotubes; Magnetic; RSM; Isotherm models

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