Preparation of amine-rich aerogel derived from graphene oxide and polyethylenimine for the adsorption of Cr(VI) in aqueous medium

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Abstract

The chromium is a metal of industrial importance and one of the most toxic heavy metals. The effluent of various industries such as textile, electroplating and leather industries contain large amount of Cr(VI) and Cr(III) which pollute the surface as well as ground water. The Cr(VI) is carcinogenic and mutagenic for human health therefore, its removal from water is necessary for safe drinking water. In this connection we have prepared the graphene oxide/polyethyleneimine (GOPEI) aerogel which showed enhanced adsorption of Cr(VI). The prepared GOPEI aerogel was characterized through FT-IR, XPS, SEM, XRD, Raman spectroscopy and BET analysis. As prepared aerogel showed maximum uptake capacity 216.38 mg/g for Cr(VI). The mechanism of Cr(VI) adsorption explored through diffusion models such as Mckay et al, Waber-Morris and Richenberg which revealed that the external diffusion and intraparticle diffusion were governed the rate of Cr(VI) adsorption. The adsorption of Cr(VI) followed pseudo-second-order kinetic model. The isotherm studies revealed that the adsorption was chemisorptions which occurred in monolayer. It was also supported by D-R isotherm. The adsorption process was found to be thermodynamically spontaneous and endothermic.