

Synthesis and low concentration Cr(VI) adsorption performance of chitosan/poly(vinyl alcohol)/Fe(III)/glutaraldehyde

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ABSTRACT

Chitosan/polyacrylamide/poly(vinyl alcohol)/Fe/glutaraldehyde (CS/PAM/PVA/Fe/GA) was reported as an adsorbent with several advantages, while some major disadvantages such as low desorption rate and poor reutilization, which formed an obstacle to its application in low-concentration Cr(VI) adsorption performance. These major disadvantages the authors speculate might be ascribed to PAM. To test the speculation correct, CS/PVA/Fe/GA was synthesized as adsorbent and then characterized using scanning electron microscopy, Fourier transform infrared spectroscopy and X-ray photoelectron spectroscopy. Low-concentration (5.0–30.0 mg L⁻¹) Cr(VI) adsorption was tested as a function of solution pH value, Cr(VI) initial concentration and adsorption time, and its primary mechanisms were explored. The results showed that, CS/PVA/Fe/GA has not only higher desorption rate and reutilization but also higher adsorption efficiency and (3.0–10.0) pH-independence compared with CS/PAM/PVA/Fe/GA; the adsorption mechanisms were also different, the complexation of the –NH₂ group with Fe(III) was especially included herein. The complexation, which was insensitive to pH, mainly contributed to the above advantages, proving our speculation correct. Thus, CS/PVA/Fe/GA is an alternative adsorbent to remove Cr(VI) from natural water.

Keywords: Hexavalent chromium (Cr(VI)); Synthesis; Adsorbent; Isotherms; Kinetics

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