ABSTRACT

Hexavalent chromium (Cr(VI)) is a toxic and carcinogenic heavy metal that is widely produced from industrial activities. Adsorption is one of the effective methods for removing Cr(VI) from water. In this study, a functionalized silica-carboxymethyl cellulose (SiO_2/CMC) material was synthesized using 3-aminopropyltriethoxysilane (APTES) to increase the number of amine active sites, thereby improving the adsorption capacity of Cr(VI). The study aimed to obtain and characterize SiO_2/CMC-APTES and evaluate its adsorption capacity based on variations in contact time and Cr(VI) concentration. Synthesis was carried out by the in-situ sol-gel method at room temperature using APTES volume variations of 1; 1.5; and 2 mL. Material characterization was carried out using Fourier Transform Infrared (FTIR) and Surface Area Analyzer (SAA), while the adsorption capacity was analyzed using UV-Vis spectrophotometry. The results showed that the dry weight of SiO_2/CMC was 3.480 g, while SiO_2/CMC-APTES with APTES variations of 1; 1.5; and 2 mL were 3.752; 4.004; and 6.557 g, respectively. The FTIR spectrum confirmed the formation of Si–O–Si bonds and the presence of C–H, –COO, and NH_2 groups. SAA analysis showed an increase in pore size from 6.471 nm in SiO_2/CMC to 10.893 nm in SiO_2/CMC-APTES 1.5 mL. The SiO_2/CMC-APTES 1.5 mL material provided the best adsorption performance with an adsorption efficiency of 92.10% at a contact time of 120 minutes (15 mg/L) and 90.65% at an optimum concentration of 30 mg/L with a contact time of 30 minutes.

Keywords: *Chromium(VI), Adsorption, Silica-Cellulose, APTES, Sol-gel*