Abstract

Due to its lethal effects on the human body and other creatures, hexavalent chromium (Cr6+) has attained widespread public attention, and an effective adsorbent for removing Cr6+ is vital. The surface properties of chitosan-based hydrogels make them efficient adsorbents for the removal of various contaminants like Cr6+. This study was aimed at removing Cr6+ from aqueous solutions by using chitosan-based hydrogels. For this purpose, novel chitosan (CS)-based hydrogel films were prepared by crosslinking CS, polyvinyl pyrrolidone (PVP), tetraethyl orthosilicate (TEOS), and sepiolite (SEP). The morphology of the prepared hydrogel films and the presence of different reactive functional groups in them were analyzed by scanning electron microscopy (SEM) and Fourier-transformed infrared (FTIR) spectroscopy respectively. The effects of initial concentration (20, 40, and 60 ppm), pH (2, 4, 6, and 8), and contact time (15, 30, and 45 min) on adsorption capacities and removal efficiencies of these hydrogel films were studied. Maximum Cr6+ adsorption capacity (23.9 mg/g) and removal efficiency (84.5%) were observed at the initial concentration of 60 ppm at pH 4 with a contact time of 30 min. This study provided one new method for producing low-cost adsorbents with effective adsorption and removal of Cr6+. The findings in this study may be helpful for future work on scaling up a water and wastewater treatment system from a pilot plant to a full-scale plant