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Abstract RM 10

REMOVAL OF Cr(VI) USING METAL ORGANIC FRAMEWORK MIL 53(Fe)

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Heavy metal contamination is one of the major chronic environmental problems in developing countries. Hexavalent chromium [Cr(VI)] is commonly used in the alloy and metal plating industries. The form Cr(VI) is responsible for causing cancers and mutations in living organisms. This study explored the possibility to remove Cr(VI) from aqueous solutions using a metal organic framework MIL 53(Fe). The MOF, MIL 53(Fe) was synthesized by dissolving $FeCl_3.6H_2O$ (10 mmol) and benzene-1,4-dicarboxylic acid (10 mmol) in 50 mL of dimethylformamide separately and stirred for 1.0 h. The two solutions were mixed; the mixture was stirred for another 1.0 h and transferred into Teflon vessels. The vessels were irradiated under high pressure with a maximum microwave heating of 1000 W for 30 min. The vessels were opened at the room temperature and the MIL 53(Fe) was collected. The MIL 53(Fe) was characterized using scanning electron microscopy and X-ray diffraction patterns. All the adsorption experiments were conducted using 0.05 g of the MIL 53(Fe) in 25.0 mL solution of 5.0 mg L^{-1} Cr(VI). Effects of experimental parameters; initial Cr(VI) concentration, shaking speed, initial pH and the temperature were determined by varying each parameter at a time. It was found that, at 30 min of contact time, 80% of Cr(VI) was removed by MIL 53(Fe). The maximum adsorption was observed at the pH range of 3.0 to 7.0. The pseudo second order kinetics explains the adsorption process with the correlation coefficient (R^2) of 0.994. The kinetics of the process is governed by both intra-particle and liquid film diffusion models. The removal of Cr(VI) was likely occurred by pore diffusion and pore adsorption. Therefore, MIL 53(Fe) adsorbent can be used as an environmentally friendly cost-effective material to remove Cr(VI) from the aqueous environment after scaling up.

Keywords: Adsorption, Cr(VI), MIL 53(Fe), MOF

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