Removal of hexavalent chromium from wastewater by acid-washed zero-valent aluminum

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ABSTRACT
This paper deals with the treatment of hexavalent chromium (Cr(VI)) and its removal mechanism using acid-washed zero-valent aluminum (ZVAI). The acid-washed ZVAI before and after reaction was characterized by scanning electron microscope, X-ray diffraction, and X-ray photoelectron spectroscopy. The influence factors such as ZVAI loading, acid washing time, and pH values on Cr(VI) removal were studied. Cr(VI) removal by acid-washed ZVAI was also evaluated under different humic acid and Fe^{2+} concentrations. The removal of Cr(VI) was accelerated with increasing acid-washed ZVAI loadings and decreasing initial pH. The addition of humic acid inhibited the Cr(VI) removal, while Fe^{2+} significantly accelerated the Cr(VI) removal. More than 98% Cr(VI) was removed from synthetic wastewater containing 20.0 mg/L Cr(VI) in 180 min by 0.4 g/L acid-washed ZVAI at initial pH 2.0. Cr(VI) removal by acid-washed ZVAI is proved by reduction, not by adsorption. The remarkable capacity of acid-washed ZVAI in removing Cr(VI) from wastewater displays its potential application in the treatment of wastewater-containing Cr(VI).

Keywords: Cr(VI); Wastewater; Zero-valent aluminum; Removal; Humic acid; Fe(II)

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