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Removal of Cr(VI) from acid mine drainage with clay-biochar composite

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ABSTRACT

A novel biochar-montmorillonite (B@M) composites was synthesized by heating peanut shell B@M and was used to remove Cr(VI) from acid mine drainage (AMD). Batch characterization confirmed that the biochar surface was covered with montmorillonite successfully. The batch adsorption experiment demonstrated that the maximum adsorption capacity of biochar and B@M was 9.18 and 12.18 mg/g, respectively. The adsorption kinetics and isotherms can be satisfactorily fitted by pseudo-second kinetic model and Langmuir model, respectively. No effect of SO_4^{2-} on Cr(VI) removal implied that B@M can simultaneously remove Cr(VI) from SO_4^{2-} aqueous solutions. XPS analysis showed that adsorption, reduction and precipitation were involved in the removal process due to the presence of Fe(II) in montmorillonite. These findings suggested that the engineered biochar-based composite may be a valuable adsorbent for the removal of Cr(VI) from AMD.

Keywords: Biochar; Clay; Cr(VI); Adsorption; Acid mine drainage

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