Desalination and Water Treatment
www.deswater.com

doi: 10.5004/dwt.2020.25085

180 (2020) 328–335
March

Activated red mud loaded porcelain sand for the adsorption of As(V) from aqueous system

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Received 11 June 2019; Accepted 23 October 2019

ABSTRACT

An effective adsorbent for arsenate removal from aqueous system was synthesized by loading activated red mud on porcelain sand (ARPS). The loading was accomplished via chemical processes and thermal coating techniques. Several kinds of techniques which include scanning electron microscopy analysis, Brunauer–Emmett–Teller method were used to study the physic-chemical characteristics of the ARPS adsorbent. Adsorption of As(V) on the ARPS adsorbent was studied as a function of time, pH, and coexisting ion. The surface morphology of the ARPS was examined and the loading mechanisms were discussed in detail. Results from the batch experiments, conducted at an initial concentration of 0.2 ppm of arsenate, Langmuir and Freundlich isotherms equation were used to fit the adsorption isotherms. The adsorption kinetic curve for the As(V) fits well with the Langmuir adsorptive equation. The maximum equilibrium saturated adsorption capacity of ARPS on arsenate was 4.424 and 0.989 mg/g respectively at pH 6 and 9. Under acidic conditions, the adsorption rate of As(V) is higher, and the adsorption decreases obviously with the increase of pH. The leaching liquid by ARPS adsorbent after toxic characteristic leaching process test can reach the national standards of GB 5749-2006. So the ARPS adsorbent is safe when application. Accordingly, it is believed that the ARPS developed in this study is environmentally acceptable and industrially applicable to water treatment.

Keywords: Red mud; Activated red mud; Preparation; Adsorption; Arsenate

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