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Preparation and Characterization of a Reactive Filter for Groundwater Defluoridation

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Abstract

In order to make anionic clay amenable in fixed bed operations, granular anionic clay composite was prepared by in-situ hybridization of synthetic magnesium aluminum layered double hydroxide (Mg-Al-LDH) onto sand and used for groundwater defluoridation. The Mg-Al-LDH with the best metal ion ratio composition was incorporated onto sand and the defluoridation efficiency of the granular composite was studied in batch and column reactor. Sequel to the operation parameters obtained from synthetic feed water defluoridation, the defluoridation of real groundwater (GW) was performed in the column reactor. The time-concentration profiles of the process showed that the rate of defluoridation was fast and the process was controlled by either chemisorption or ion exchange. Experimental evidences affirmed the role of anion exchange as the underlying mechanism of defluoridation. The defluoridation efficiency of the fixed bed was far higher with synthetic feed water than with GW. The spent fixed bed was regenerated with 0.5M NaOH and reused in different defluoridation cycles.

Keywords: Anionic clay; sand; composite material; defluoridation; groundwater; fixed-bed

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