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Application of recycling waste products for ex situ and in situ water treatment methods
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Abstract
The specific objectives of the study were to determine the approximate design parameters for filter bed and highlight the possible scope of using mixed iron oxides rich smelter slag for in situ or ex situ treatment. The batch and column study was conducted to assess the As removal capacities from contaminated water. X-ray fluorescence (XRF) analysis of the slag waste product determined the presence of large quantities of iron (Fe). In this study, the maximum removal capacities were found to be approximately 1.78 mg As per g of slag and 100% removal of As(V) was achieved during the first 30 days of three column operations. The changes in redox potential (Eh) values and the changes in effluent pH throughout the column operation period indicated redox reactions occurring in the system. The column experiments were modelled using a semi-analytic solution to the advection–dispersion–adsorption equation incorporated in the commercial software, Pollute V7. From the best-fit of the modelling results to the experimental breakthrough curves, the hydrodynamic dispersion coefficient (D) was found to be 0.0115 and 0.00775 m2/day for column 1 and column 2, respectively, and 0.00862 m2/day for column 3. The values of the distribution coefficient (KD) were 0.18, 0.173 and 0.171 m3/kg or L/g for the three columns and 0.24 L/g from the batch test. The results from the experiments may be used to aid the design of a filter bed or reactive barrier in a scenario where the mixed iron oxides rich smelter waste product is used as a candidate reactive medium. © 2018, © 2018 Informa UK Limited, trading as Taylor & Francis Group.

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