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Efficiency of an iron matrix-based filter in adsorption of arsenic from water

Seiran Shahmohammadi[a], Behzad Shahmoradi[b,*], Afshin Maleki[b], Jae-Kyu Yang[c], Seung-Mok Lee[d,*]

[a]*Department of Environmental Health Engineering, Faculty of Health, Kurdistan University of Medical Sciences, Sanandaj, Iran*
[b]*Environmental Health Research Center, Research Institute for Health Development, Kurdistan University of Medical Sciences, Sanandaj, Iran, emails: bshahmoradi@muk.ac.ir/bshahmorady@gmail.com (B. Shahmoradi)*
[c]*Department of Environmental Engineering, Kwangwoon University, Seoul, Korea*
[d]*Department of Environmental Engineering, Catholic Kwandong University, Ganeung 25601, Korea, email: leesm@cku.ac.kr*

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ABSTRACT

Pollution of water resources, specifically ground water, with heavy metals and metalloids has turned into one of the greatest worldwide concerns. Among several inorganic pollutants, arsenic and pollution of natural water resources with arsenic have gained much attention due to the high toxicity of this metalloid. Therefore, this study was aimed at investigating adsorption of arsenate from water by a filter containing an iron matrix. The removal efficiency of all filter layers and the effect of the operational conditions including pH (6–9), flow rate (1–20 L/h), arsenate concentration (200–1,000 μg/L), turbidity (0–20 NTU) and chloride concentration (0–0.9 mg/L) were evaluated to optimize the process. Finally, the filter was applied for 10 h to adsorb As(V) from a water system contaminated with 510 μg/L As(V). The Pearson correlation coefficient was calculated using SPSS software. Accordingly, turbidity and flow rate variables with the values of –0.545 and –0.517, respectively, had the highest correlation with the adsorption efficiency of arsenic. The observed trends of removal efficiency at different operational conditions suggested 500 μg/L initial As(V) concentration, 2 L/h flow rate, pH 7, 0 NTU turbidity and 0 mg/L calcium hypochlorite concentration as the optimal adsorption conditions. The optimal extent of removal efficiency was found to be 98.7%. According to the findings of this study, the proposed filter has a high efficiency of adsorptive removal of As(V) from water.

Keywords: As(V); Filter; Adsorption; Iron filings; Activated carbon

* Corresponding authors.