

Removal of Arsenic from Drinking Water using Chitosan based Mesoporous Magnesia Impregnated Porous Alumina: Performance Evaluation by Packed Bed Column

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Abstract

Presence of dissolved arsenic in contaminated groundwater has now emerged as a major concern on a global scale due to its extreme toxicity. In the present study, we report a newly adsorbent made of magnesium oxide impregnated porous alumina (MIPA) synthesized using biopolymer chitosan template for remediation of arsenic from drinking water. The adsorbent was characterized by BET, SEM, FTIR and EDAX analysis. The performance of adsorbent was studied in a packed bed continuous flow column. The adsorbent worked effectively over wide range of pH and showed a maximum adsorption capacity 17.2 mg/gm at initial arsenic concentration of 20 mg/l. The experimental data fitted well in Pseudo-second order kinetics. Thermodynamic study revealed that arsenic adsorption on porous adsorbent is spontaneous and exothermic process. A bed depth service time (BDST) approach was adopted in continuous flow system to evaluate column efficiency (N) 1346.21mg/l and adsorption rate (K) 0.1166 l/mgh. The columns were regenerated by eluting the bound As (V) with NaOH (1M) which resulted in 98% desorption of As (V). Moreover, their influence of different operating conditions such as bed depth, flow rate, initial arsenic concentration was investigated statistically by the experimental design (two level full factorial) in view of industrial application. A column (10 cm) performance of real arsenic-contaminated groundwater was also evaluated and treated effluent water quality is suitable for domestic use. Thus this study indicated that MIPA is a promising adsorbent for As (V) removal from drinking water.

