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عنوان مقاله :

Response surface methodology for strontium removal process optimization from contaminated water using zeolite nanocomposites

چکیده :

The effective removal of strontium from polluted water is an emerging issue worldwide, especially in Japan, after the destruction of Fukushima's Daiichi Nuclear Power Plant. In the strontium removal process, statistical optimization of associated factors is needed to reduce the quantity of chemicals and the number of experimental trials. In this study, response surface methodology based on the central composite design was employed for assessing the influence of different factors and their interaction effects on the efficiency of strontium removal. We have considered nanoscale zero-valent iron-zeolite (nZVI-Z) and nano-Fe/Cu zeolite (nFe/Cu-Z) as adsorbents for the effective removal of strontium. The results suggested that the studied three factors such as pH, contact time, and concentration are positively related to the adsorption of strontium. That is, the maximum strontium removal occurred at pH, initial concentration, and contact time of ۱۲, ۲۰۰ mg L-۱, and ۳۰ min, respectively. The experimental maximum strontium adsorption capacity of nZVI-Z and nFe/Cu-Z adsorbents is ۳۲٫۵ mg/g and ۳٤ mg/g, respectively. The present study also showed that the most statistically significant potential contributor was initial concentration, followed by contact time in the removal process. The study indicated that the interaction effect between contact time and initial concentration was statisticallyimportant, suggesting the need for a multi-mechanism technique in the removal phase of strontium. Tóth, Langmuir, DubininAstakhov (D-A), Freundlich, and Hill isotherm models were also fitted with the experimental strontium adsorption data, in which the Tóth model fitted best compared to the other models based on the RMSD and R۲