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Uranium extraction by sulfonated mesoporous silica derived from blast furnace slag

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Abstract

Blast furnace slag (BFS), mainly from the factory of Helwan for iron making industries, was found to be an economically possible raw material for the production of silica. Silica gel obtained from BFS was activated with concentrated sulfuric acid at high temperature to obtain sulfonated mesoporous silica. The sorption, as well as the mechanisms of uranium ions by the modified silica sorbent, was tested and discussed in term of equilibrium, isotherm, kinetic and applicability. The results show that the sorption of uranium was fast and the majority of sorption was completed in 15 min. The results showed the better fit of pseudo-second-order with the experimental sorption data with a significant high coefficient of correlation (R^2 >0.99). Compared to the other isotherm models, uranium sorption by sulfonated silica follows the Langmuir and D-R isotherm plots. The results from solid/liquid ratio experiments show that the studied sorbent removed uranium nearly 85 and 73% from synthetic and granite leach liquor solutions, respectively. A maximum sorption capacity values of 48.75, 63.74 and 73.8 mg/g were obtained for adsorption of uranium from sulfuric, hydrochloric, and nitric media, respectively. Sulfonated mesoporous silica is a promising adsorbent for the uranium recovery from granite leach liquor.

Keywords: Extraction; Mesoporous; silica; Blast furnace slag**.**

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