Removal of uranium (VI) from liquid waste of calcareous shale, Allouga, southwestern Sinai, Egypt

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ABSTRACT

One of the main problems faced at the Allouga uranium project during the recovery of uranium was the presence of high chloride content in the uranium mineralization that ranged between 6 and 8%. It was necessary to remove the chloride by washing the uranium-bearing material several times with freshwater. This procedure used a large amount of water and the washed pregnant solution contained higher than 12 g/l of chloride and 10 mg/l of U(VI). The obtained solution had to be kept in vats and tanks which presented environmental problems due to the inability of quaternary amine resins such as D263B (Chinese resin which is considered to be the most suitable tool for uranium recovery) to extract the solution containing high chloride. Synthetic acrylamidoxime and hydrazinyl amine resins were used on polyethylene non-woven fibers, followed by Fourier transform infrared spectroscopy, SEM, and elemental analysis. The synthetic resins have a chelating site for the UO$_2^{2+}$ and exhibited a very high capacity for metal sorption. It seems that this synthetic resin has 1,000 times higher rate of adsorption than D263B. This was due to its high affinity for U (VI) and low affinity for chloride.

Keywords: Allouga; Calcareous shale; Uranium; Waste; Resin