PREPARATION OF HIGH EFFICIENT ADSORBENTS AND DESIGN OF ADSORPTION BED FOR RECOVERY OF URANIUM FROM SEAWATER

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Summary

Uranium was recovered from seawater with high-performance amidoxime fibers synthesized from commercial poly(acrylonitrile) fibers. The adsorption rate of uranium with optimized 1.5-denier fiber was about 850 mg kg^{-1}-dry fiber day^{-1}. To increase the contact between adsorbent and seawater, amidoxime fiber was packed in spherical plastic shells, and the adsorbent balls were packed in a cage moored below the sea surface. The first field test was carried out in Imari bay. The cage was towed for 30 hours at a velocity of 1 m s^{-1} or moored in the bay for 37 days. The amount of uranium adsorbed agreed well with the simulation model, and the adsorption fiber proved to be resistant to biological errosion. The second field test was performed outside the bay to investigate the effects of ocean current on the adsorption rate. The adsorption rate was significantly increased even at the current flow rate of 0.2 m s^{-1} because of the vertical wave motion.

The desorption of uranium from the amidoxime fiber was also investigated using batchwise and flow-through operations. With an eluent of 0.1mol L^{-1} HCl, the desorption was accomplished in 2h even after uranium was accumulated to 15 ppm in the solution. The desorption rate from adsorbent balls packed in a flow-through desorber was found to be controlled by the molecular diffusion in the swollen fiber. Water in the void of adsorbent balls was removed by a weak centrifugation.