

Preparation of Adsorptive Fibers for Removal of Radioactive Cesium from Seawater

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Summary

We prepared a potassium cobalt hexacyanoferrate-impregnated fiber that can remove radioactive cesium from seawater at a high rate in various contact modes. First, an anion-exchange-group-containing vinyl monomer (dimethylaminoethyl methacrylate, DMAEMA) was graft-polymerized onto a γ -ray-irradiated 6-nylon fiber. Second, hexacyanoferrate ions were adsorbed onto the DMAEMA-grafted fiber. Third, potassium cobalt hexacyanoferrate was impregnated onto the fiber by precipitating hexacyanoferrate ions with cobalt ions. Approximately 100 kg of the cesium-adsorptive fiber in wound form was produced per batch using a pilot-scale reactor. At a mass ratio of seawater to fiber of 100 by batch contact, cesium concentration decreased from 10 mg-Cs/L to less than the detection limit (0.2 mg-Cs/L) within 30 min. The adsorption isotherm was correlated by a Langmuir-type equation, which gives a concentration factor of 12,000 at a seawater Cs concentration of 10 mg-Cs/L. In addition, the potassium cobalt hexacyanoferrate-impregnated fiber was made combustible at 500°C in air without emitting hydrogen cyanide to reduce the volume of the fiber.