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Recovery of Uranium from Seawater by Polymeric Adsorbent Systems

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In order to maintain a sustainable reserve of nuclear fuels for the nuclear power industry, tremendous research efforts have been devoted to the development of advanced adsorbent materials for extracting uranium from seawater. Uranium exists uniformly in the world's oceans in the form of a tricarbonate complex at a concentration of 3.3 μgL−1. Adsorbents which have been developed include inorganic adsorbents, which showed poor selectivity and low capacity, to the most recent polyethylene-fiber-based sorbents containing amidoxime–carboxylic acid copolymers. This presentation will focus on the development and performance of three classes of advanced adsorbents developed as a part of the integrated research effort overseen by the U.S. Department of Energy Office of Nuclear Energy to reduce the technology cost of extracting uranium from seawater: (1) high-surface area polymer fiber adsorbents based on radiation-induced grafting, (2) polymer fiber adsorbents derived from atom-transfer radical polymerization (ATRP), and (3) surface-functionalized polyacrylonitrile fiber adsorbents. The pros, cons, and cost of each technology will be discussed along the recent developments on improving the capacity and the uranium to vanadium selectivity. The potential for these adsorbent to be used in other applications, such as cleanup of heavy metals in mine tailing, will be discussed.

Country or International Organization

USA

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