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The Preparation of Titanate Nano-Materials Removing Efficiently Cs-137 from Waste Water in Nuclear Power Plants

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Abstract : Cs-137, the radioactive fission products of uranium, can be easily dissolved in water during the accident of nuclear power plant, such as Chernobyl, Three Mile Island, Fukushima accidents. The concentration of Cs in the groundwater around the nuclear power plant exceeded the standard value almost 10,000 times after the Fukushima accident. The adsorption capacity of Titanate nano-materials for radioactive cation (Cs+) is very strong. Moreover, the radioactive ion can be tightly contained in the nanotubes or nanofibers without reversible adsorption, and it can safely be fixed. In addition, the nano-material has good chemical stability, thermal stability and mechanical stability to minimize the environmental impact of nuclear waste and waste volume. The preparation of titanate nanotubes or nanofibers was studied by hydrothermal methods, and chemical kinetics of removal of Cs by nano-materials was obtained. The adsorption time with maximum adsorption capacity and the effects of pH, coexisting ion concentration and the optimum adsorption conditions on the removal of Cs by titanate nano-materials were also obtained. The adsorption boundary curves, adsorption isotherm and the maximum adsorption capacity of Cs-137 as tracer on the nano-materials were studied in the research. The experimental results showed that the removal rate of Cs-137 in 0.01 tons of waste water with only 1 gram nano-materials could reach above 98%, according to the optimum adsorption conditions.

Keywords : preparation, titanate, cs-137, removal, nuclear
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