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Separation of Y from Sr by zirconium vanadate gel ion-exchanger sorbent: kinetics and thermodynamic study

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Abstract

A new zirconium vanadate (Zr-V) ion-exchanger was synthesized and characterized for fast and selective separation procedure of Y-90 from Sr-89. The method was based on Y-90(III) sorption from aqueous HCl solution containing Sr-89(II) onto Zr-V gel exchanger. The kinetics of Y(III) sorption from HCl solution by Zr-V exchanger was subjected to Weber-Morris, Lagergren, Bhattacharya and Venkobachar, and Bt models. Initially, the uptake of Y(III) onto the exchanger was fast followed by kinetically first-order sorption with an overall rate constant, K (Lager) = (3.55 +/- A 0.03) x 10(-4) min(-1). Film and intraparticle transport are the two steps that might influence Y(III) sorption. The negative values of Delta G of Y-90 retention dictate that, the process is a spontaneous. The negative values of Delta H and Delta S reflect the exothermic nature of Y-90(IIsorption and the random uptake of Y-90(III) onto Zr-V sorbent. Zr-V exchanger offers unique advantages of Y-90(III) retention over conventional solid sorbents in rapid and effective separation of traces of Y-90(III) from Sr. The exchanger was successfully packed in column for an effective separation of Y-90.

Keywords

Author Keywords: Yttrium(III); Strontium(II); Zirconium vanadate ion-exchanger; Retention; Kinetic models; Thermodynamic; Column
KeyWords Plus: CARRIER-FREE Y-90; SR-90-Y-90 GENERATOR; POLYURETHANE FOAMS; EXTRACTION SYSTEM; YTTRIUM; RESIN; WATER; RADIOIMMUNOTHERAPY; PRECONCENTRATION; CHROMATOGRAPHY

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