SYNTHESIS AND ION EXCHANGE PROPERTIES OF CERIUM(IV) SELENITE

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Amorphous samples of a new inorganic ion exchanger, cerium(IV) selenite have been prepared under varying conditions. The material prepared by mixing 0.025M ceric sulfate and 0.025M sodium selenite in the ratio of 1:1 was studied in detail for its ion-exchange capacity, chemical stability, IR, thermogravimetry and K_d values. Separations of metal ions have been performed on columns of this ion exchanger.

Introduction

Many new synthetic inorganic ion exchangers have been reported during the last few years. These ion exchangers show good selectivities toward certain elements and have been found useful in analytical separations. The selenite ion exchangers have received little attention. In an earlier paper we have reported the preparation and ion exchange properties of lanthanum tungstate. The present paper describes the synthesis, ion-exchange properties and analytical applications of cerium(IV) selenite.

Experimental

Reagents

All the chemicals were of analytical grade (B. D. H. or E. Merck),\(^{76}\) As,\(^{60}\) Co,\(^{140}\) Ba,\(^{134}\) Cs,\(^{51}\) Cr,\(^{64}\) Cu,\(^{152}\) Eu,\(^{54}\) Mn,\(^{59}\) Mo,\(^{65}\) Ni,\(^{232}\) Th,\(^{235}\) +\(^{238}\) U, and\(^{65}\) Zn radioisotopes were supplied by Nuclear Research Centre, A. E. O. I., Tehran, Iran.
**Apparatus**

Thermogravimetric analysis was performed on a Stanton thermobalance type 750/770 and X-ray studies were made with a Philips unit. A Perkin-Elmer IR spectrophotometer was used for IR studies.

**Preparation of ceric selenite**

Six different samples of ceric selenite were prepared by mixing ceric sulfate, and sodium selenite solutions under varying conditions, given in Table 1. The pH of the reaction mixture was adjusted by adding either HCl or NaOH. On standing for 24 hrs, the gel settled. It was then filtered off, washed three times with demineralized water, and dried in an oven at 50 °C. The material was converted into H⁺ form.

**Ion exchange capacity**

The ion exchange capacity of each sample was determined by the standard method as before.\(^1\)\(^3\) Results are given in Table 1.

**Composition**

200 mg portions of the ion exchanger sample were dissolved in hot concentrated HCl, selenium was separated by sulfur trioxide treatment and determined gravimetrically,\(^1\)\(^4\) while cerium(IV) was determined spectrophotometrically.\(^1\)\(^5\)

**Chemical stability**

All the samples are stable in water, dilute mineral acids, ethanol, methanol, acetone, ether and dilute alkali solutions. They are slightly soluble in 4M HCl, 4M HNO₃ and 1M NaOH.

**Distribution coefficients**

For distribution studies 0.1 g of the ceric selenite (sample 6) was equilibrated at 25 ± 1 °C in 20 ml of 0.005M metal ion solution. The concentration of Ca(II),