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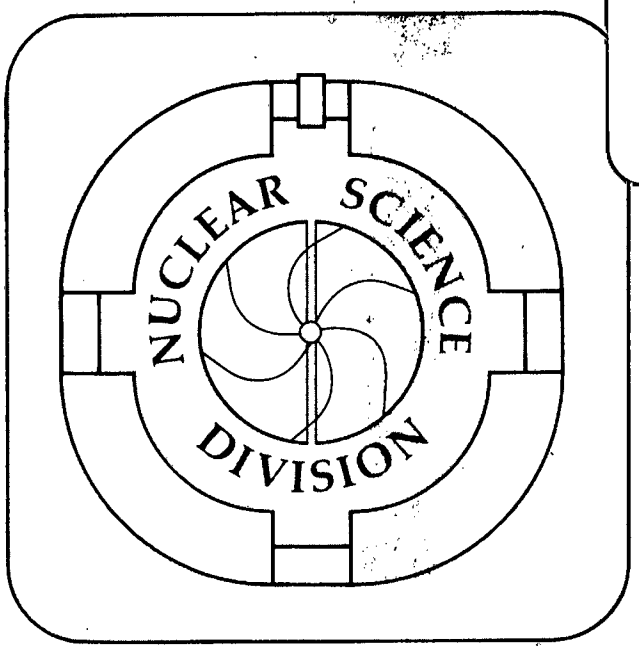

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DISCLAIMER

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INTRODUCTION

Berkelium and cerium can be easily separated from the rest of the actinides and lanthanides using their oxidation/reduction properties. However, a separation of the two elements from each other is more difficult to achieve and generally quite time consuming. In an attempt to measure decay properties of short-lived Bk isotopes produced in heavy ion reactions, it was mandatory to develop a procedure for a fast separation of the two elements. The methods described in the literature are either too time consuming (1) or could not be reproduced in our laboratory (2,3).

The procedure developed in our work combines the separation of

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Bk and Ce from other actinides, lanthanides and fission products with a subsequent fractionation of the two elements using high pressure liquid chromatographic (HPLC) techniques.

EXPERIMENTAL

Berkelium and cerium were oxidized with 0.1M CrO_3 in 4M HNO_3 to the 4+ state, extracted with 0.15M 2-diethylhexylorthophosphoric acid (HDEHP) in heptane, reduced to the 3+ state with H_2O_2, back-extracted into 10M HNO_3 (4), and this solution was evaporated to dryness. The residue was dissolved in 0.1 ml of 0.5M HNO_3 and was injected onto the cation exchange column of an HPLC-system (ALTEX-BECKMAN, Model 110A). The precision glass column (100 mm x 2 mm) was filled with the resin in the Na-form (Benson Co., BC-X12, 7-10 µm) and was heated with a water jacket to a temperature of 82°C. After the injection of Bk/Ce, the elution was started using 0.5M ammonium alpha-hydroxyisobutyrate at pH 4.2 for the berkelium fraction (1-110 drops, 1 drop = 15 µl), with a change of the eluant to pH 4.4 for the cerium fraction (111-200 drops). A flow rate of 0.5 ml/min (resulting in a pressure of ~ 300 psi) was employed. A typical elution curve is shown in Fig. 1. A very good and clean separation of the two elements is obtained, the elution peaks being quite sharp and having only little tailing.

The Bk and Ce fractions can be evaporated to dryness or be co-precipitated as fluorides with La-carrier in order to prepare suitable samples for γ-ray and β^--counting. The total separation time for Bk from a complex mixture of actinides and fission products, including extraction and subsequent operation of the HPLC-column,

amounts to about 8 minutes. The separation of Bk on the HPLC-column takes only about 4 minutes from the injection to the completion of the elution. The chemical yield for Bk is ~ 80% for the column and ~ 50% for the complete separation procedure.

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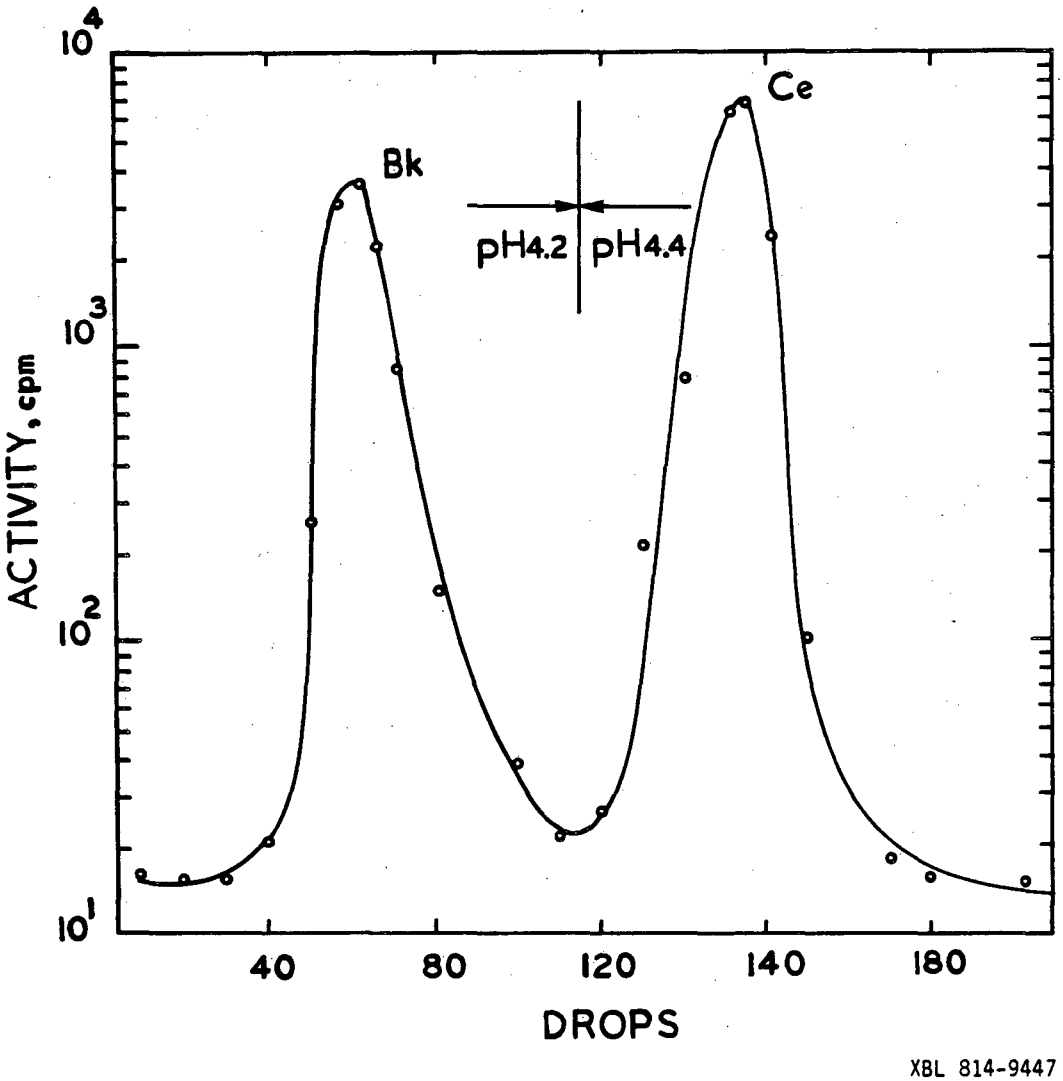

FIG. 1 Elution curve of Bk and Ce using 0.5M ammonium alpha-hydroxyisobutyrate

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