SEPARATION OF ACTINIDE AND FISSION PRODUCT ELEMENTS
BY MEANS OF THERMOCHROMATOGRAPHY AND FRACTIONAL
SUBLIMATION OF THEIR $\beta$-DIKETONATES

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Received 4 April 1989
Accepted 18 April 1989

The heterogeneous ligand exchange synthesis
of volatile $\beta$-diketonates of some actinides
/230Th, 233U, 239Pu, 241Am/ and fission
product elements /90Sr, 90Y, 113Sn, 113mIn/
and their separation by means of thermochro-
matography and fractional sublimation are re-
ported. The methods are efficient for the
separation of elements of different oxidation
states.

INTRODUCTION

Volatile $\beta$-diketonates have been studied for several
years with the intention to use them for the separation
of elements by means of fractional sublimation and gas
chromatography1-4. The heterogeneous ligand exchange as
a method for the synthesis of $\beta$-diketonates5 gives ad-
ditional opportunities in this field because it facil-
itates the synthesis to a great extent and makes it
possible to combine it with the separation of complexes.
Thermochromatography in comparison with gas-liquid chromatography is characterized by low separation efficiency, but complicated equipment is not required and thus can be applied for the separation of complexes that greatly differ in volatility. In the previous papers\(^6,7\) we have described the sublimational and thermochromatographic methods for the separation of \(^{230}\)Th and \(^{233}\)Pa, \(^{95}\)Zr and \(^{95}\)Nb, \(^{243}\)Am and \(^{239}\)Np. This paper deals with the application of these methods for the separation of volatile \(\beta\)-diketonate complexes of the other actinide and fission product elements.

**EXPERIMENTAL**

Throughout the experiments the solutions of the radiochemically pure isotopes were used: \(^{230}\)Th /\(C_{Th}=0.669\) mg ml\(^{-1}\) in 2-3M HNO\(_3\)/, \(^{233}\)U /\(C_{U}=0.057\) mg ml\(^{-1}\) in 2M HCl/, \(^{239}\)Pu /\(C_{Pu}=0.314\) mg ml\(^{-1}\) in 1M HNO\(_3\)/, \(^{241}\)Am /\(C_{Am}=0.380\) mg ml\(^{-1}\) in 0.3M HNO\(_3\), americium contained the admixture of \(^{242}\)Cm - 5% of total \(\alpha\)-activity/. The solutions containing equilibrium mixtures of \(^{90}\)Sr-\(^{90}\)Y /\(C_{stable\ Sr}=10^{-3}\) mg ml\(^{-1}\), \(C_{HNO_3}=10^{-3}M\)/ and \(^{113}\)Sn-\(^{113}\)In /\(C_{stable\ Sn}=7x10^{-3}\) mg ml\(^{-1}\), \(C_{HCl}=6M\)/ were also used.

Thenoyltrifluoroacetone /HTTA, manufactured by "Schuchardt"/ was used without additional purification. hexafluoroacetylacetone /HHFA, manufactured by "Ferak"/ was distilled before use, acetylacetone /HAA, reagent grade/ was purified according to Ref. /8/. The carrier gas argon was dried over \(P_2O_5\).

The synthesis and thermochromatographic separation of volatile metal \(\beta\)-diketonates were performed in the flow of carrier gas, saturated with \(\beta\)-diketone vapours, by