

SOLVENT EXTRACTION STUDIES USING TETRACYCLINE
AS COMPLEXING AGENT IX.
SEPARATION OF SCANDIUM FROM ZINC

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Separation of scandium from zinc is accomplished by solvent extraction technique using benzyl alcohol-tetracycline solution as organic phase.

INTRODUCTION

Separation of zinc from scandium is important in activation analysis when both elements are present in the same sample to be analysed since the radioisotopes ^{65}Zn and ^{46}Sc have gamma rays with photopeak energies too close one to the other. ^{46}Sc can be counted in a mixture of the two radioisotopes by means of the photopeak of 889.3 keV; however, the main photopeak for ^{65}Zn , with energy corresponding to 1115.52 keV, suffers interference of the 1120.5 keV photopeak of ^{46}Sc . The annihilation peak for ^{65}Zn suffers interference from many other radioisotopes. Half-lives of both radioisotopes are too long (83.9 days for ^{46}Sc and 245 days for ^{65}Zn) to wait one of the isotopes to decay in order that the other might be counted free of interferences.

EXPERIMENTAL

The experimental technique used was described in previous works^{1,2}. The radioisotopes ^{46}Sc and ^{65}Zn were obtained by irradiation of powder metallic zinc and of Sc_2O_3 , in a thermal neutron flux corresponding to $5 \times 10^{12} \text{ n cm}^{-2} \text{ sec}^{-1}$ for 8 and 32 hours, respectively. Sc_2O_3 was dissolved with drops of HClO_4 and HNO_3 . Zinc was dissolved with drops of HClO_4 . In both cases the excess of acids was eliminated by heating.

Extraction took place at $25^\circ \pm 0.5^\circ \text{C}$ and the separatory funnels were mechanically shaken for 30 min at that temperature.

Concentration of NaClO_4 in the aqueous phase was equal to 0.10 M and of tetracycline in the organic phase, 0.01M. Benzyl alcohol was washed and pre-saturated with distilled water and the aqueous phase was pre-saturated with benzyl-alcohol.

After equilibration the phases were separated by centrifugation and the pH was measured. Activities of ^{46}Sc and ^{65}Zn were measured in a well type NaI(Tl) detector coupled to a single channel analyser. To avoid interference by counting in NaI(Tl) detector, the experiments were carried out labelling only one of the elements each time, meaning ^{46}Sc and inactive zinc in one series of experiments, and inactive scandium and ^{65}Zn in another series of experiments.

RESULTS

Preliminary experiments had shown that the cations Sc^{+3} and Zn^{+2} are not extracted into benzyl alcohol in the absence of the complexing agent tetracycline. Fig. 1 shows the extraction curves for zinc and scandium into benzyl alcohol-tetracycline solutions and Table 1 shows the numerical results for a separation experiment.

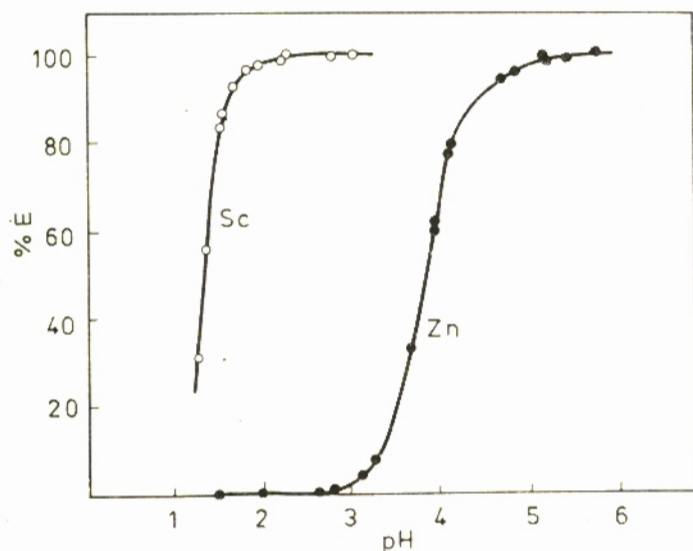


Fig. 1. Scandium and zinc extraction curves. Concentration of $\text{Sc} = 1.0 \times 10^{-5} \text{M}$; $\text{Zn} = 1.0 \times 10^{-4} \text{M}$; $\text{NaClO}_4 = 0.10 \text{M}$ and $\text{TC} = 0.01 \text{M}$

TABLE I
Separation of scandium from zinc

Scandium		Zinc	
pH	% E	pH	% E
2.45	94.6	2.55	1.7
2.55	97.3	2.55	2.2
2.95	97.6	2.75	3.1

Concentrations:

$\text{TC} = 0.01 \text{M}$; $\text{Sc} = 10^{-5} \text{M}$; $\text{Zn} = 8 \times 10^{-5} \text{M}$; $\text{NaClO}_4 = 0.10 \text{M}$

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REFERENCES

1. M. Saiki, F. W. Lima, Radiochem. Radioanal. Lett., 29 (1977) 67
2. M. Saiki, F. W. Lima, Radiochem. Radioanal. Lett., 30 (1977) 1.