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AEC-NASA TECH BRIEF



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Separation of Traces of Metal Ions from Sodium Matrices

The problem:

To develop a rapid and effective method for isolating traces of metal ions from sodium matrices, particularly sea water, alkali metal reactor coolants and certain biological fluids.

The solution:

A quantitative method for the isolation of traces of metal ions from sodium matrices. The extraction, which was developed for sodium matrix samples after neutron activation, is accomplished using 2-thenoyltrifluoroacetone (TTA) and dithizone followed by cation exchange. The entire working procedure can be completed in less than four hours.

How it's done:

The technique consists of two extractions and an ion-exchange step. In the first extraction, metal ions which form stable TTA-complexes in sodium chloride solutions buffered with sodium acetate to a pH of 4.7 to 6.1 are extracted with 0.1M TTA in benzene, tetrahydrofuran. More than 30 elements, including rare earths, uranium, thorium, titanium, zirconium and hafnium, are completely extracted under these conditions.

Following this extraction, other traces of metal ions are extracted from the same aqueous solution using 0.001M dithizone in benzene as the extractant. In this extraction, silver, cadmium and mercury are completely extracted, and antimony is partially extracted. Most elements not extracted as TTA-chelates are virtually nonextractable.

To remove residual sodium ion from the two organic extracts, this element is selectively adsorbed from the organic phases (after the addition of pyridine) on the strongly acidic cation exchanger Dowex 50. Absolute removal of the sodium is achieved.

Following this final purification step, the elements thus isolated can be determined radiometrically. These

radioactive measurements were performed by using standard counting techniques.

Notes:

1. Complete details of the technique and the working procedure are presented in "Separation of Traces of Metal Ions from Sodium Matrices," ANL-7421, Argonne National Laboratory, February, 1968. Report is available from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151; price, \$3.00 (microfiche, \$0.65).
2. It should be noted that the extractants used in the technique are relatively nonselective and additional separations may be required for the determination of particular elements by standard counting techniques.
3. Research groups using neutron activation may be interested in this information.
4. Inquiries may be directed to:

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Reference: B69-10168

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Patent status:

Inquiries concerning rights for commercial use of this innovation may be made to:

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