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Study of Actinide Chemistry in Saturated Potassium Fluoride Solution

A study has been made concerning the chemistry of the actinides in saturated KF solution. The areas examined were solubilities, absorption spectra, oxidation-reduction reactions, and solid compounds which can be produced in the KF solution. The study includes work with neptunium, uranium, and americium.

Results indicate that U(IV) is the only uranium oxidation state soluble in saturated KF solution; Np(IV), Np(V), Np(VI), and Am(III) are soluble. Of the soluble Np species, Np(IV) is the most soluble and Np(VI) is the least soluble. Absorption spectra were obtained for all these ions.

The oxidation-reduction reactions of neptunium were studied. Four new neptunium complex fluorides were prepared and identified by x-ray powder patterns as α -K₂NpF₆, β ₁-K₂NpF₆, KNpO₂F₂, and K₃NpO₂F₅. Two additional compounds were prepared, but not identified; these are a complex Np(III) fluoride and a complex Np(V) fluoride.

The fluoride solvent was prepared by dissolving reagent grade KF in 99.8% D₂O for the neptunium studies and in H₂O for the uranium and americium work. D₂O solutions were used so that spectral measurements could be made in the near-infrared region. The saturated KF solution in D₂O is 12.4 M and in H₂O is 12.6M.

The neptunium was purified by an anion column, and alpha pulse analysis showed no other species than Np²³⁷. The uranium solutions were prepared from reagent grade UNH. A pulse analysis of the americium showed it to contain 47% Am²⁴³ and 53% Am²⁴¹ by activity.

The reactions were carried out in Pyrex, quartz, and polycarbonate containers. There was very little attack upon the glass by fluoride ion.

Notes:

1. The study adds to the basic knowledge of chemistry. It may be useful for the preparation of various materials from the salts of these actinides.
2. The information may also be of interest to radiologists.
3. Additional details are contained in *Advances in Chemistry Series*, no. 71, "Lanthanide/Actinide Chemistry", p. 256-267 (1967).
4. Inquiries concerning this innovation may be directed to:

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Patent status:

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

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