Papers

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Crystal Structures of Some Complex Chlorides of Trivalent and Tetravalent Plutonium[+]

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The compounds K_2PuCl_5, Rb_2PuCl_5, K_2PuCl_6, and Rb_2PuCl_6 have been prepared. The latter two compounds were verified to contain only Pu(IV) by chemical analysis and spectrophotometry in solid and solution. The crystal structures of these compounds were determined by x-ray powder (Debye–Scherrer and Guinier) diffraction. The results are as follows:

K_2PuCl_5: Orthorhombic, Pnma, K_2PrCl_5 type [1]. $a = 12.675 \pm 0.003$, $b = 8.728 \pm 0.002$, $c = 7.970 \pm 0.002$ Å.

Rb_2PuCl_5: Orthrohombic, Pnma, K_2PrCl_5 type [1]. $a = 13.078 \pm 0.005$, $b = 8.908 \pm 0.003$, $c = 8.177 \pm 0.004$ Å.

K_2PuCl_6: Monoclinic, C2/m, distorted K_2PtCl_6 type. $a = 10.45 \pm 0.03$, $b = 10.12 \pm 0.03$, $c = 10.47 \pm 0.05$ Å; $\beta = 92.7 \pm 0.2°$ (tentative assignment).

Rb_2PuCl_6: Hexagonal, $P6_3mc$, Rb_2GeF_6 type [2]. $a = 7.374 \pm 0.005$, $c = 11.91 \pm 0.001$ Å.

1 G. Meyer and E. Hüttl, *Z. Anorg. Allg. Chem.*, *497*, 191 (1983).
2 L.R. Morss and J. Fuger, *Inorg. Chem.*, *8*, 1433 (1969).

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The Vapor Pressure of Americium Trichloride

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The saturation vapor pressure of americium trichloride has been measured by means of a new technique using 100 to 200 micrograms of $AmCl_3$. The trichloride is prepared in an x-ray capillary using the classical Fried-Davidson method, and is identified by means of its x-ray pattern. The capillary is transferred to the vapor pressure apparatus, its tip is broken, and the contents are sublimed into the vapor pressure cup. The cup is next suspended in a bath of molten tin, and the buoyancy is measured by the deflection of a quartz fiber torsion balance, from which the cup is suspended. A detailed description of the measurement will be given. The vapor pressure of $AmCl_3$ may be described by the equation:

$$\log p \text{ (mm Hg)} = -\frac{(13157 \pm 515)}{T} + (11.94 \pm 0.67)$$

The thermodynamic parameters derived from the vapor pressure measurement will be reported.

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Recent Achievements in Single Crystal Growth of Actinide Compounds

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Important progress has been achieved in solid state physics of the element uranium since large and perfect single crystals of uranium metal and compounds are available. To allow similar progress in the solid state physics of the other actinide elements, a large effort has been undertaken at the European Institute for Transuranium Elements to grow single crystals of actinide compounds with cubic crystal structure like the dioxides, the monopnictides, the monochalcogenides, and some intermetallic compounds.

The single crystals enable the measurement of physical properties related to the electronic structure in order to extend the knowledge of chemical bonding in the 5 f transition elements.

The different steps allowing the preparation of actinide samples for solid state physics investigations are:

– preparation of actinide metals
– refining of actinide metals
– preparation of compounds by direct synthesis