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SUPERACID CHEMISTRY OF ACTINIDE AND LANTHANIDE METALS, OXIDES AND FLUORIDES

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We have studied the reactions of superacids such as SbF_5/HF and AsF_5/HF with a variety of 4f and 5f substrates. Superacids have a powerful ability to strongly complex even the most highly intractable f-element substrates and to convert them to forms which are readily amenable to conventional chemical study. Examples include high fired dioxides and sesquioxides, fluorides and metals of the lanthanides and actinides (Th-Am). Characterization of the resulting complexes by vibrational and electronic spectroscopy and by X-ray diffraction shows that the strong metal complexation occurs via fluoride bridges from superacid anions. The reaction chemistry of the complexes, particularly with powerful oxidizers such as F_2 , ClF_3 , O_2F_2 and KrF_2 , has also been investigated and low-temperature volatilization of U-Pu was readily effected. In this paper we discuss the characterization of the 4f and 5f complexes of superacids and their general reactivity patterns with strong oxidizers.

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