

CYCLE DE CONFÉRENCES DE CHIMIE

Avec le concours de : *Université Clermont Auvergne*
SIGMA Clermont
Ecole Doctorale des Sciences Fondamentales de l'UCA
Société Chimique de France, Section Auvergne

Jeudi 4 avril à 16 h

Amphi Rémi (site des Cézeaux)

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Some Chemistry with Uranium and Thorium

A novel access to highly-pure uranium and thorium halides UX_3 , UX_4 , and ThX_4 is presented. A chemical vapor transport starts directly from MO_2 ($M = Th, U$), which is easily obtained. The respective AlX_3 is used as in situ reactant and transport agent. The tetrahalides MX_4 ($X = Cl, Br, I$) are obtained in crystalline form. UF_4 , free of oxidic impurities, is obtained by reduction of UF_6 with sulfur in anhydrous hydrogen fluoride (aHF). The uranium trihalides are obtained by reaction of the respective UX_4 with Si powder and in situ purified by chemical vapor transport. The reactions of these halides with various solvents, such as aNH₃, aHF, and aHCN are reported, e.g. UF_5 reacts with aHCN under the formation of $[UF_5(HCN)_2]$ (Figure 1).



Figure 1: A single crystal of $[UF_5(HCN)_2]$ inside a Schlenk tube

Some chemistry with UF_6 , UF_5 , UCl_6 , UCl_5 , and UBr_5 is shown. For UCl_6 a novel low-temperature modification is reported and structurally discussed. It is shown that the UCl_6 structure type, i.e. the crystal structure of UCl_6 at room temperature, has been reported wrong. A new synthesis for UBr_5 is reported, as well as a new modification, γ - UBr_5 . In case of UBr_5 and UCl_5 , aNH₃ reacts under the formation of an ammine complex of the UN_2 molecule (Figure 2). The UN_2 molecule is isoelectronic to the well-known UO_2^{2+} cation, and features UN triple bonds.

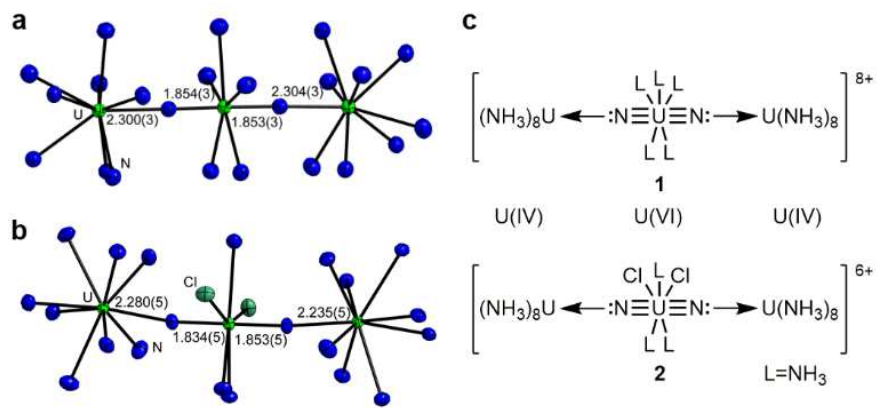


Figure 2: The obtained UN₂ complexes and their Lewis structures. Bond lengths in Å