

5. Summary

A number of gold fluor compounds have been synthesized and its structures determined. Some structural principles of the octafluorometalates of Re and U have been elucidated.

1. Octafluororhenate(VII) and Octafluorouranate(VI)

Re and U form high oxidation states. Even then their ionic radii are fairly large. That is why Re and U are capable of forming stable eight coordinated fluorocomplexes.

The following compounds were prepared and their crystal structures determined.



The following Octafluororhenates(VII) and Octafluorouranates(VI) were prepared and characterized by Raman spectroscopy:



The spectra appear similar for all compounds.

All attempts to prepare simple crystals of octafluorouranate(V) failed.

Thus far the following structural principles seem valid for eight coordinated fluorocomplexes:

1. The geometry of the anion is a fairly regular square antiprism, regardless of the cation involved.
2. The averaged angle α as a measure for the distortion of the square antiprism depends somewhat on the electronic configuration of the central atom:

$$4d^{10} : 57.6^\circ \quad 4d^{10} 5s^2 : 57.9^\circ \quad 5d^1 : 57.9^\circ$$

$$5d^0 : 57.5^\circ \quad 5f^0 : 57.0^\circ$$

Compare $\alpha = 57.1^\circ$ for an ideal square antiprism.

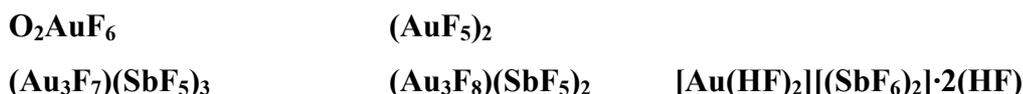
3. The M-F bonding distances are affected by cation-anion interactions. For UF_8^{2-} distances ranging from 207 pm to 215 pm are observed.

The compounds **Cs(Re₂N₂F₉)** and **Ca(H₄)(U₄O₈F₁₄)** were obtained by accident. Their crystal structures have been solved.

The crystal structures of **ReF₆** has been redetermined from single crystal data.

2. Gold fluorides

The following gold fluor compounds were prepared and their crystal structures determined.



A new modification was obtained for **Dioxygenylhexafluoroaurat(V)** comprising an ordering variant of the known (disordered) structure.

Gold pentafluoride is the only pentafluoride with a dimeric structure in the solid state. It is an extreme stronger Lewis-acid, even stronger than SbF₅. This is suggested by Ab-initio calculations.

(Au₃F₇)(SbF₅)₃ is a mixed valence gold(II/III) fluor compound. The structure comprises ribbons extending into infinity in one dimension.

(Au₃F₈)(SbF₅)₂ comprises a layer structure. It may be written more appropriately as [Au^{II}(Au^{III}F₄)₂](SbF₅)₂. Comparison of the fluor-bridging distances in the (Au-F-Sb)-unit suggests that AuF₃ is a stronger F⁻ acceptor than the SbF₅ molecule in the solid state.

[Au(HF)₂][(SbF₆)₂] · 2(HF) is the first know Au-HF-coordination compound.