

The Synthesis and Characterisation of Uranium-Chalcogenide Complexes

Rosie Magnall,¹ Elizabeth Wildman and Steve T. Liddle¹

¹School of Chemistry, University of Manchester, Oxford Road, Manchester, M13 9PL, UK

Topic: Old Elements, New Technologies: how to improve the quality of life

Abstract:

In the U.K. the current procedure for nuclear waste involves putting it in specially contained containers and burying them underground; the waste would currently fill around 500 football fields.¹ Recycling waste to separate the useful products would result in a reduced volume of waste to bury. However, the chemistry of uranium is far from being fully understood which may partially explain why we are not yet able to recycle our waste efficiently.²

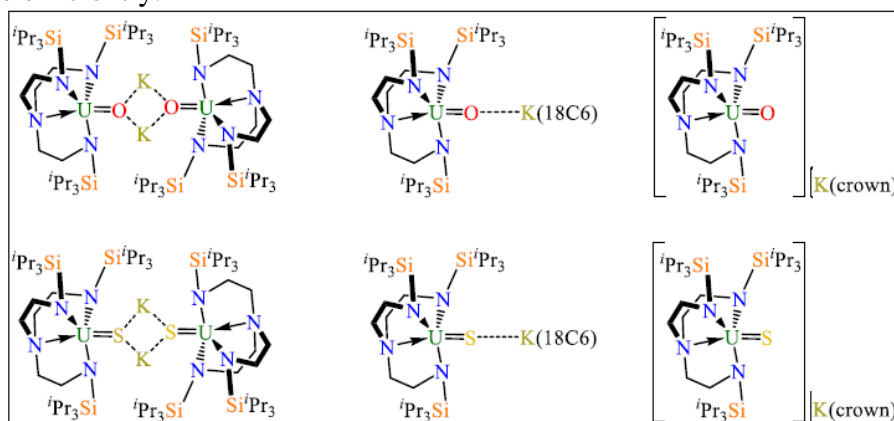


Figure 1: Targeted Uranium-Chalcogenide Complexes

This work focusses on the synthesis and analysis of a family of uranium-oxygen and uranium-sulphur containing complexes. These were synthesized using air-free techniques due to their highly unstable nature. The complexes were subjected to a range of analytical techniques and quantum calculations in order to probe the electronic structure and true identity of the complexes. By examining these complexes and comparing them to similar literature complexes, we are able to make some conclusions about the type of bonding which exists in the complexes, as well as the type of bonding in which uranium is able to participate. The covalency of uranium and other *f*-elements has long been debated but no firm conclusion has yet been made.³ Only by synthesizing and analyzing uranium containing products will we be able to answer this and other fundamental questions in order to facilitate an improved nuclear waste remediation process.

Acknowledgements: This work was partially supported by The University of Manchester and The EPSRC

References

1. The British Geological Society
2. Kaltsoyannis N. and Liddle S.; *Chem*, **2016**; *1*; 652-662
3. S. T. Liddle, *Chem. Sci.*, **2014**, *5*, 2489-2497