

Heterometallic Uranyl Alkoxides: Revisiting the Non-Aqueous Uranyl Chemistry

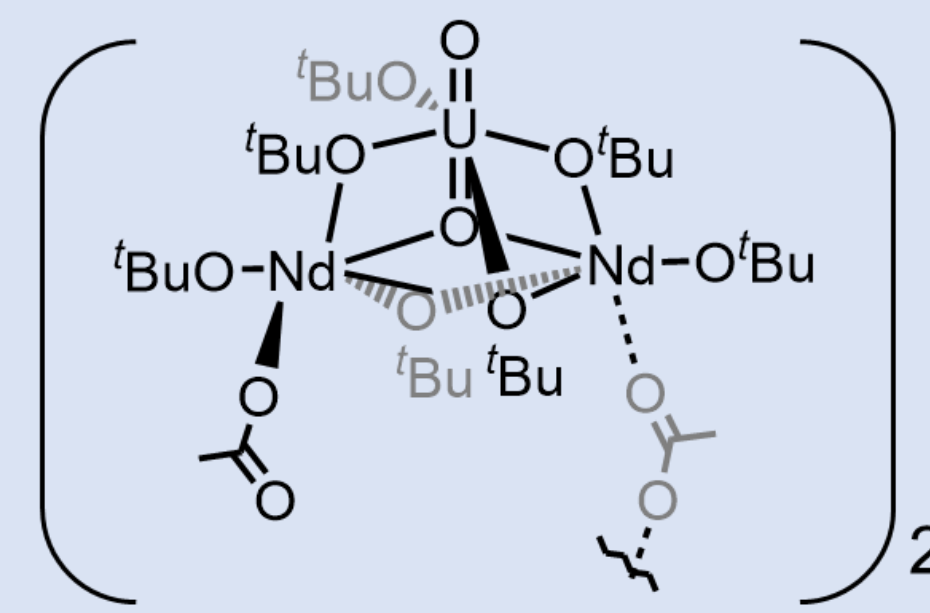
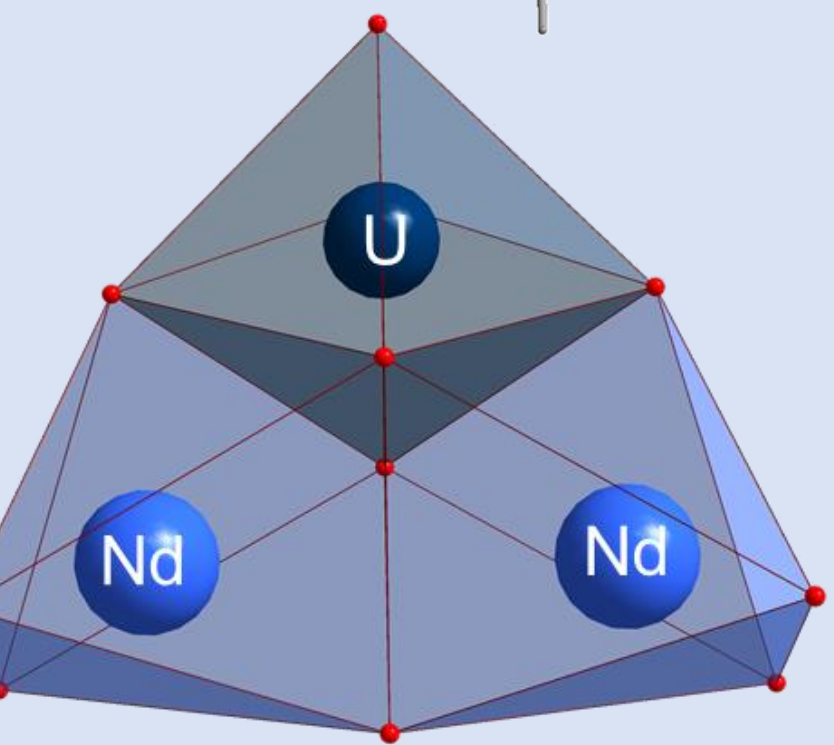
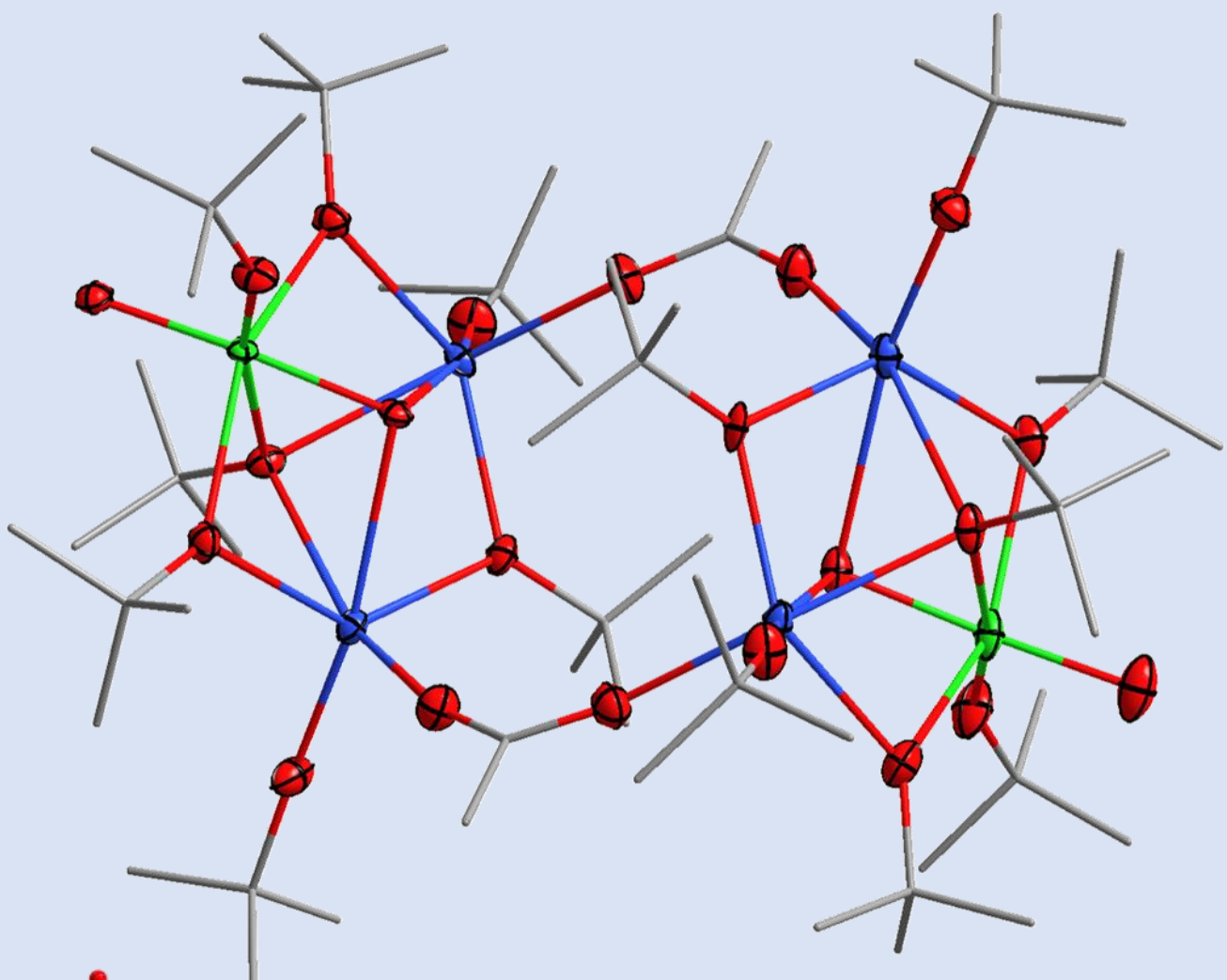
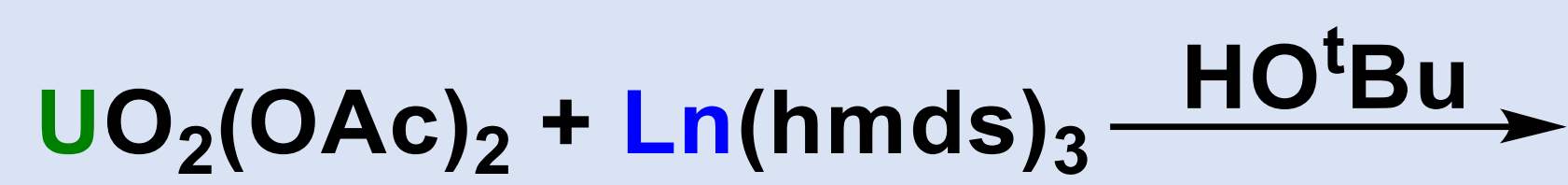


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ABSTRACT: We have revisited non-aqueous uranyl chemistry and hereby present the first heterometallic uranyl alkoxides with lanthanides and transition metals by reactions with $\text{UO}_2(\text{OAc})_2$ and the corresponding silylamides of the metals $\text{M}^{x+}[\text{N}\{\text{Si}(\text{CH}_3)_3\}_2]_x$ ($\text{M} = \text{Ln}, \text{Zr}$) in the presence of tert-butanol. The Zr containing compound $[\text{Zr}_2\text{UO}_2(\text{OtBu})_8(\text{OAc})_2]$ can be described as a trinuclear core chain, while the

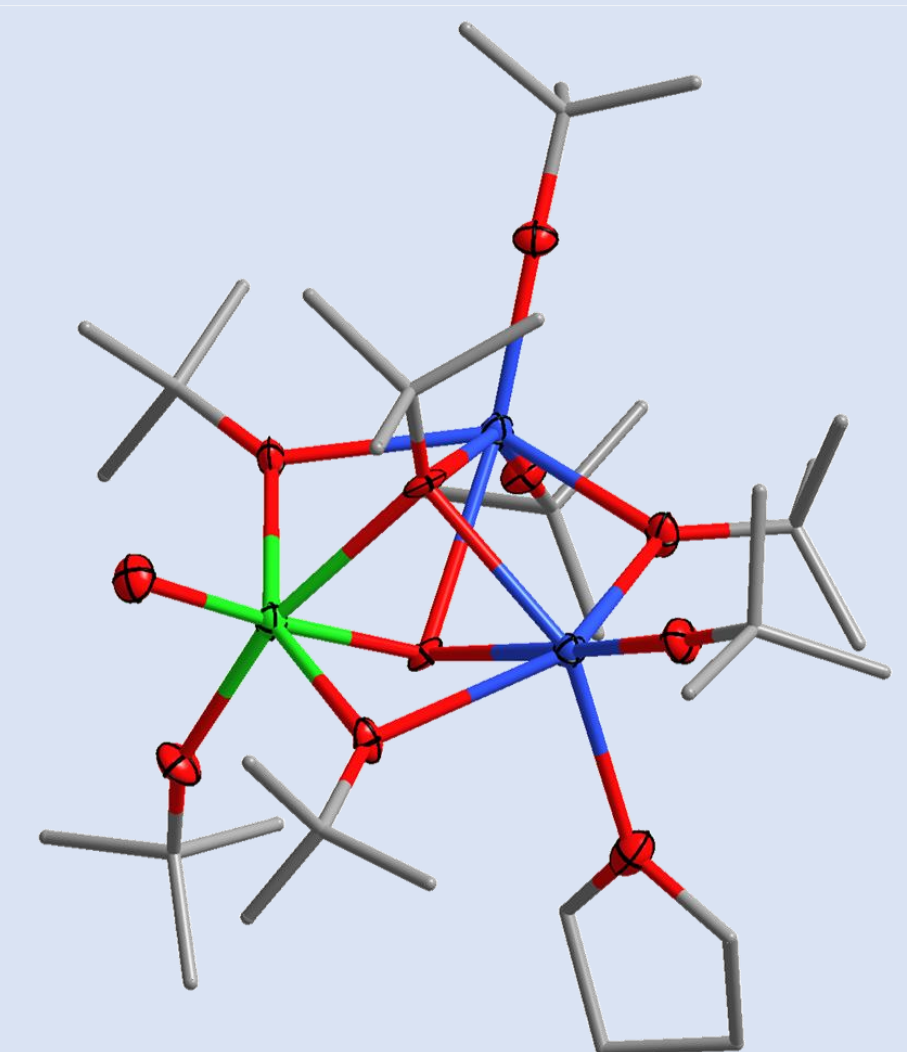
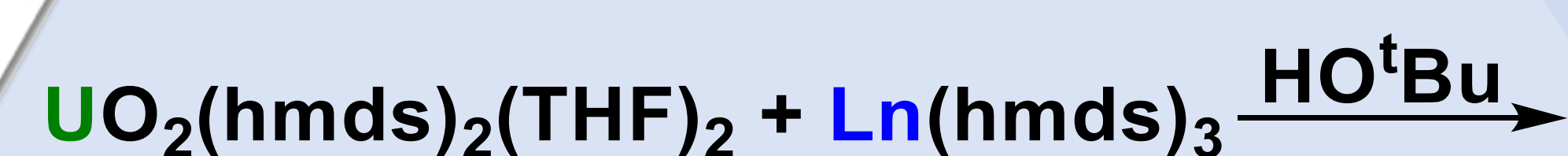
lanthanides lead to a planar triangle $[\text{Ln}_2\text{UO}_2(\text{OtBu})_7(\text{OAc})]_2$ forming dimers by acetate bridging. In terms of application, UZrO_4 nanoparticles were obtained by microwave assisted decomposition of $[\text{Zr}_2\text{UO}_2(\text{OtBu})_8(\text{OAc})_2]$ and $[\text{Ln}_2\text{UO}_2(\text{OtBu})_7(\text{OAc})]_2$ was analyzed via electron spin resonance (EPR) with regard to single molecule magnets.



Bimetallic U/Ln

U(IV)
 $[\text{Rn}]5f^2$
 0.89 Å

Properties



Synthesis

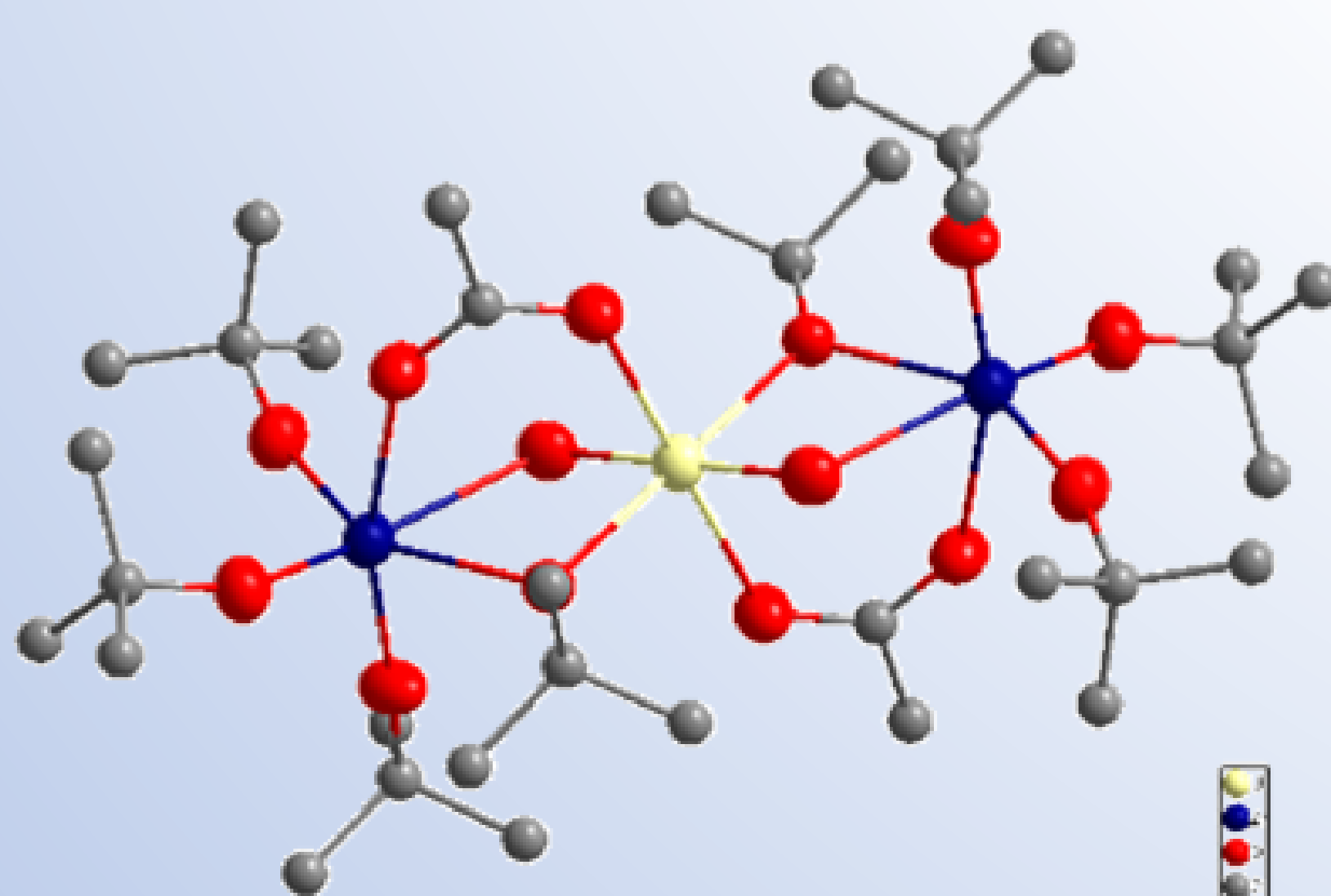
- ^1H NMR reaction control
- SXRD confirmed
- Elongation of $\text{U}=\text{O}$

92

U

Uranium
 238.03

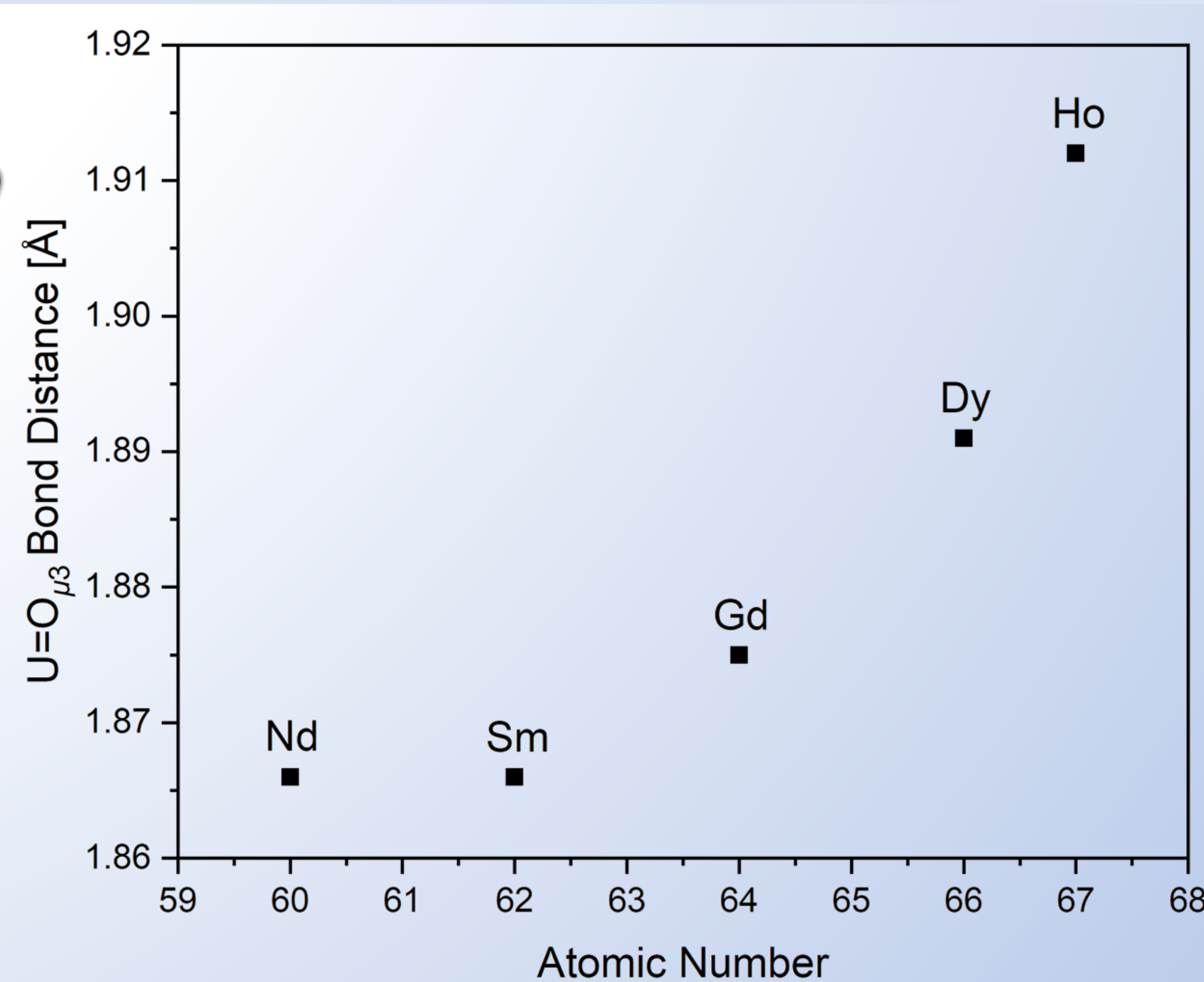
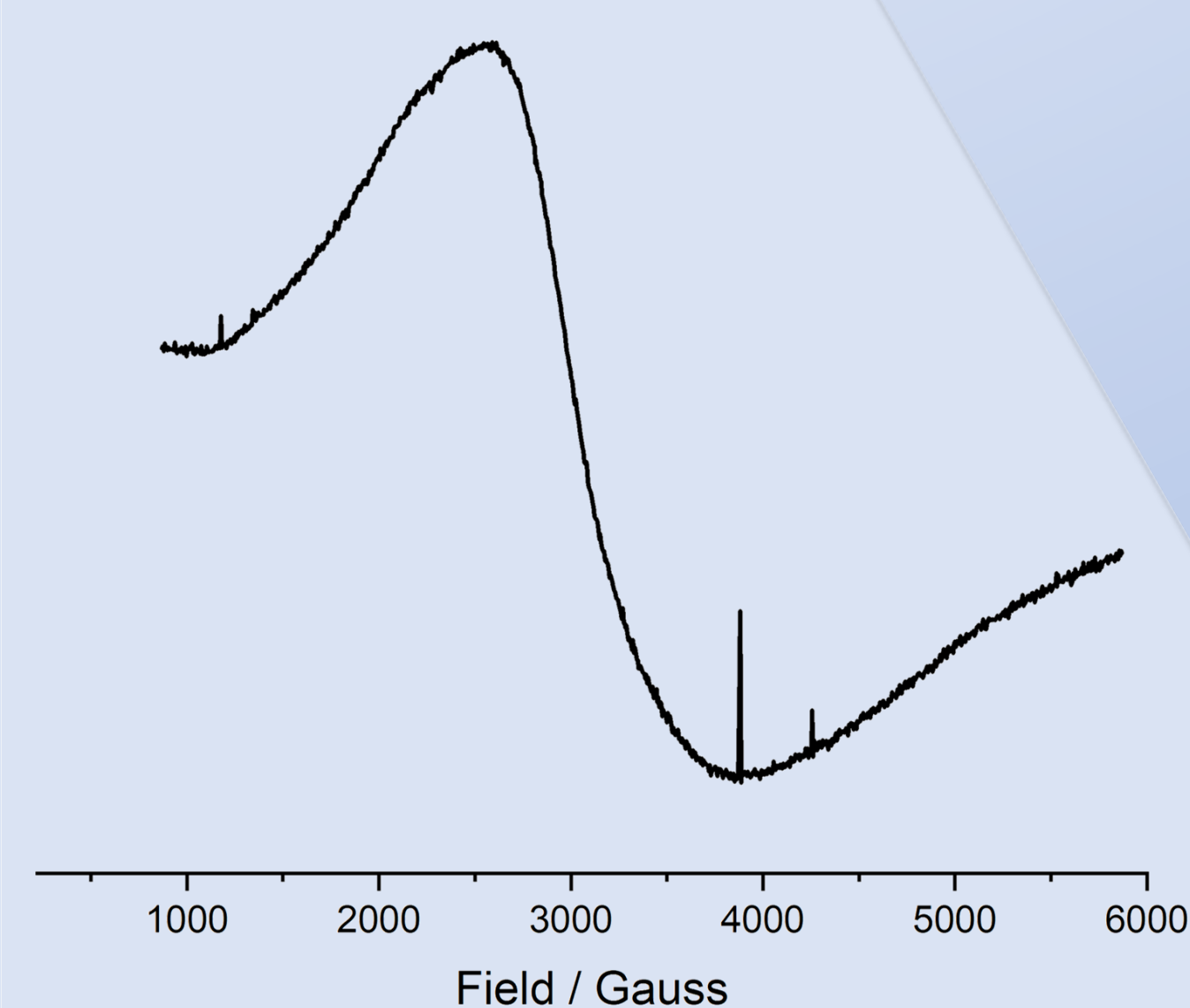
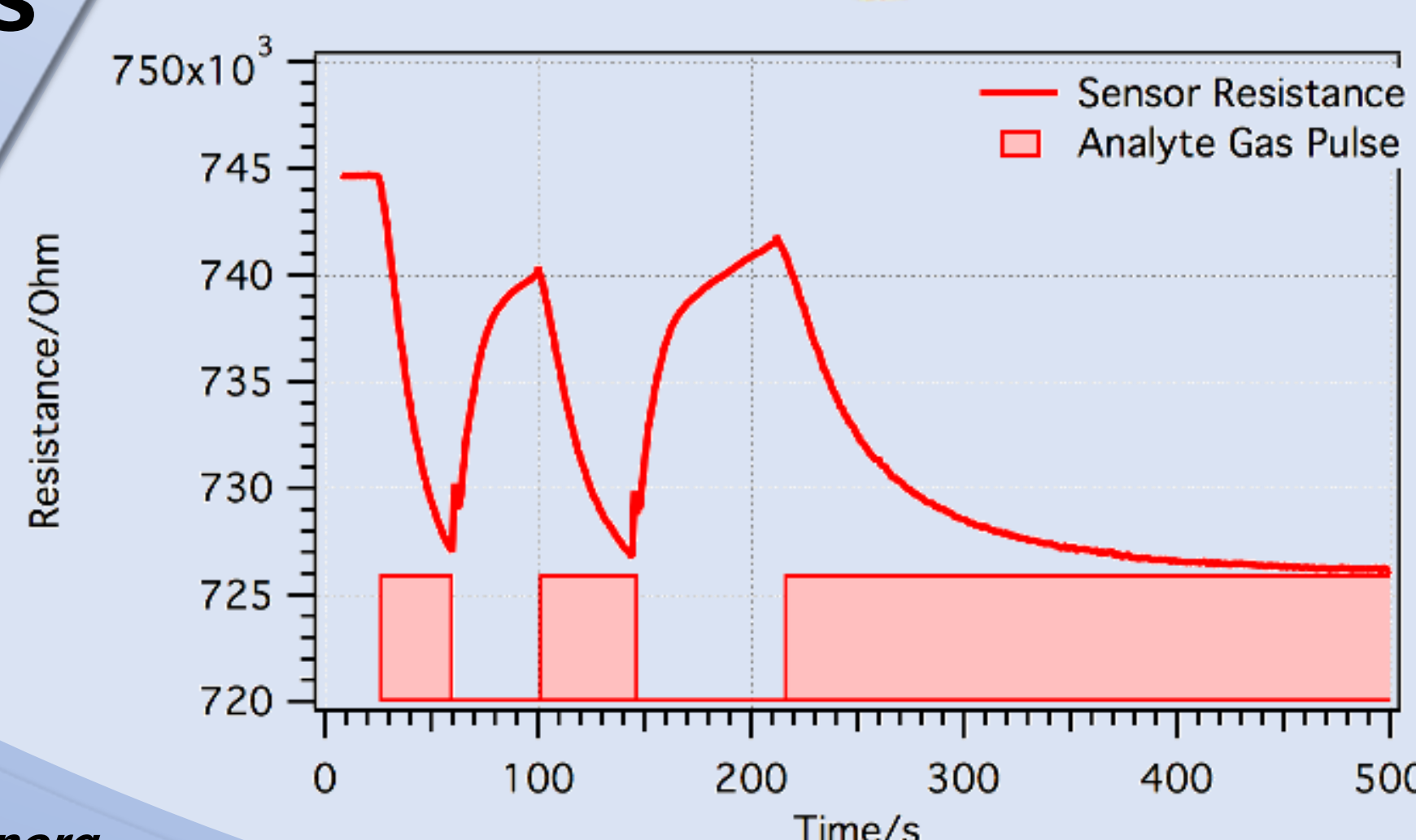
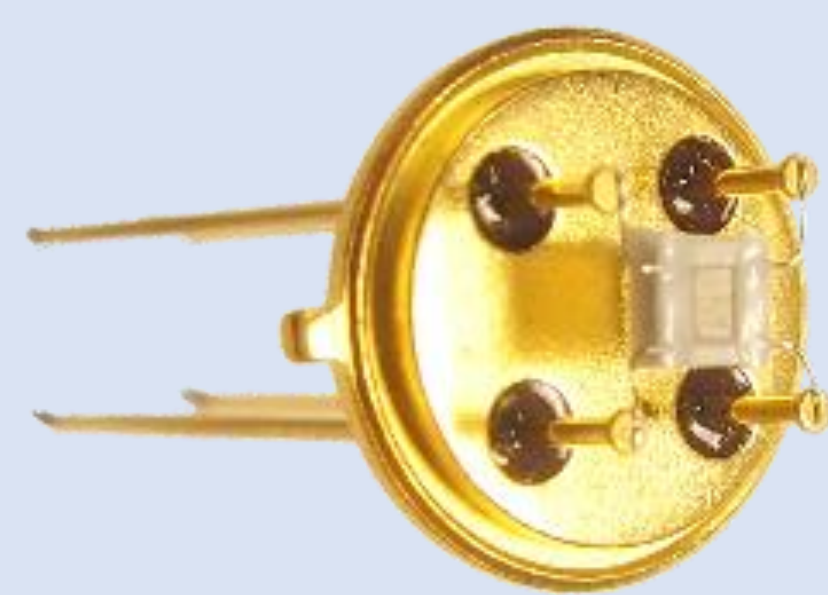
Properties



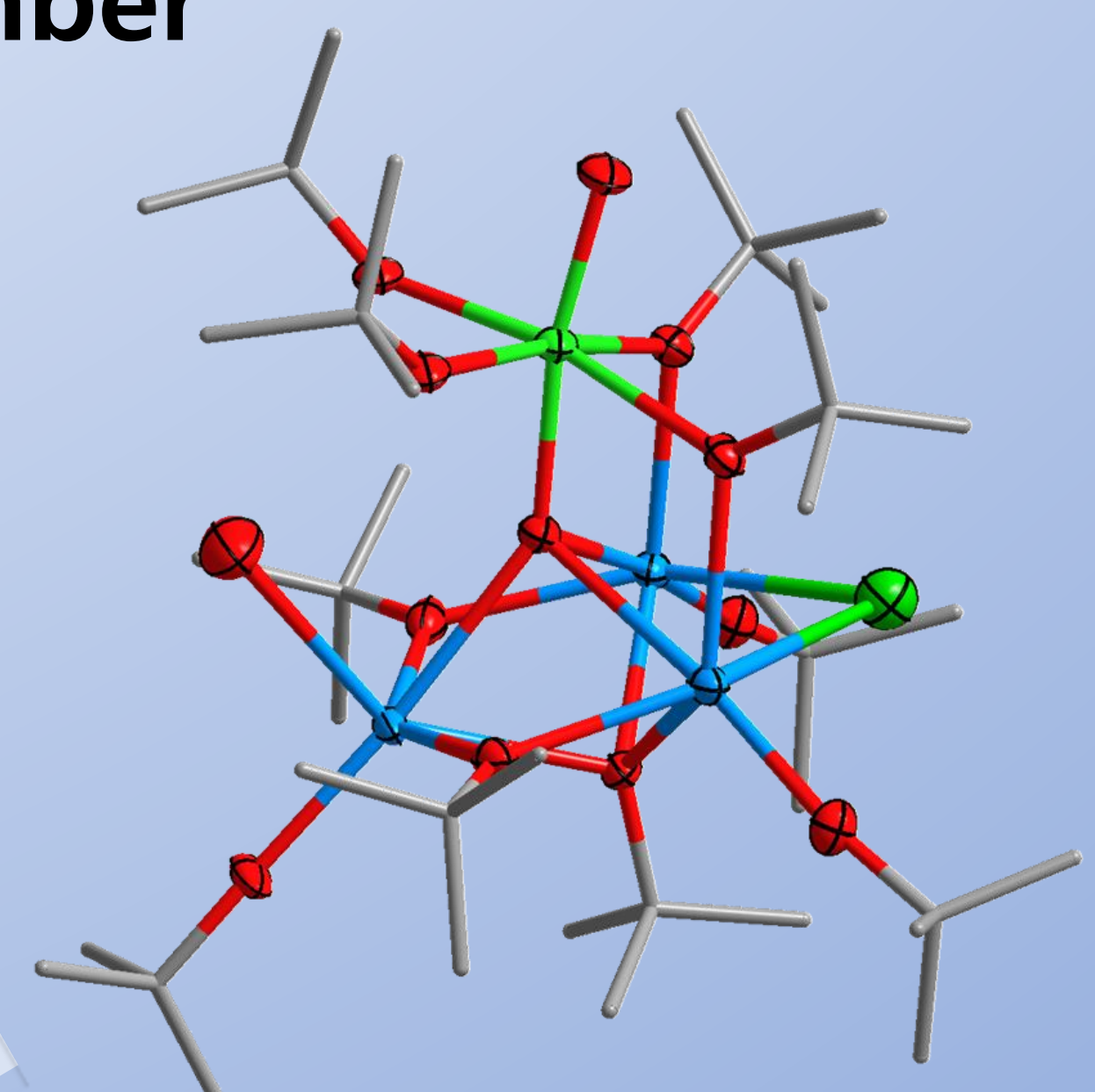
Bimetallic U/Zr

Applications

- Gas Sensing
- Single Molecule Magnets



- Prone to side reactions with increasing atomic number



- Cost-effective since waste material
- Fixation of actinides from high-level nuclear waste
- Gas sensing capabilities were tested towards CO_2 at room temperature

References:

[1] C. J. Burns, D. C. Smith, A. P. Sattelberger, H. B. Gray, *Inorg. Chem.* 1992, 31, 3724–3727.