

Intrinsic Bonding and Reactivity of Actinide Clusters Poster

October 2024

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http://www.inl.gov

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PRESENTER: Christopher Zarzana

project is to develop new capability to study transuranic elements, increasing our understanding of chemical bond formation at the far edges of the periodic table. This is critical for solving technical challenges such as development of advanced nuclear fuel cycles and efficient rare earth separations, as well as a broader understanding of bonding across the entire periodic table.

RESULTS

- Established the capability at INL to study gas-phase complexes containing transuranic atoms.
 - One of only three instruments in the world
- Spectra collected using approximately 500 ng (~0.2 μCi) of ²⁴³Am. We believe we can cut that amount down by at least a factor of 10, decreasing the radiolytic hazards and expanding the envelope of transuranics that can be investigated.

New capability at Idaho National Laboratory for studying transuranic elements

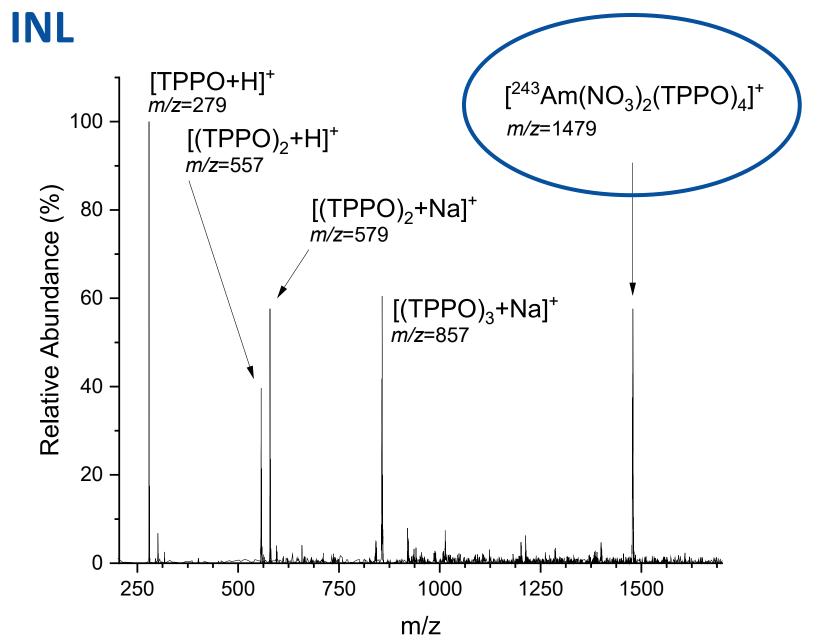
Final Edge of Poster



Approach:

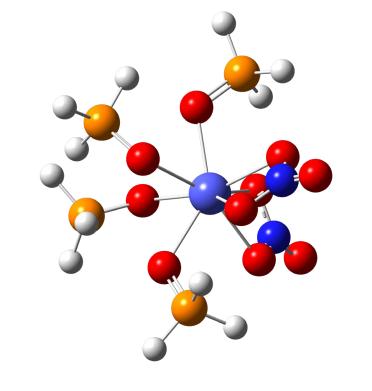
- Atmospheric pressure ionization mass spectrometry can form clusters containing actinide atoms from extremely small quantities of radioactive material
- Metal-ligand interaction is probed in the gas phase, revealing intrinsic behavior

First spectra of transuranic cluster ions at



TPPO=triphenyphosphine oxide

Quantum chemistry calculations are underway to understand electronic structure



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