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Report

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TRANSACTINIDES ARE BECOMING COMPLEX(ED) - STUDIES OF VOLATILE GROUP 4 ELEMENT METAL COMPLEXES WITH HEXAFLUOROACETYLACETONE

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Gas phase chemical studies have proven to be a powerful tool for the investigation of the transactinides (Z≥104). Simple inorganic compounds such as (oxy)halides or oxides of elements Rf (Z=104) to Hs (Z=108) were investigated with this technique. Due to technical limitations such as the beam plasma in the recoil chamber, it was not possible to study more complex or thermally unstable compounds.

Physical preseparation of nuclei produced in heavy-ion-induced fusion reactions overcomes most of these limitations. Investigations of new compound classes such as volatile metal complexes and organometallic compounds appear feasible when preseparation is employed.

We have begun studies on the formation of beta-diketonato complexes with the lighter homologs of Rf. Zr and Hf are known to form volatile complexes with hexafluoroacetylacetone (hfa). Short-lived Zr and Hf isotopes were produced in the nuclear reactions $^{18}O+^{nat}Ge$ and $^{50}Ti+^{112,116,120,124}Sn$, respectively, and physically preseparated in the Berkeley Gas-filled Separator (BGS). They were thermalized in a gas-filled volume which was flushed with hfa enriched He and transported to an adjacent oven. Volatile metal complexes were formed in-situ and transported with the gas flow to a detection system.

These studies show the feasibility of the approach. The broader implications on the field will be discussed.

We are currently constructing a detection system for α-decaying isotopes for a first experiment with Rf. The most recent results will be presented.

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