Contribution ID: **167** Type: **Verbal**

Decomposition studies of W and Mo carbonyl complexes and their implications for future experiments with Sg(CO)6

Monday, 12 May 2014 14:00 (15 minutes)

Recent experiments at RIKEN (Japan) showed that Sg carbonyl (Sg(CO)6) can be produced with yields high enough for experimental investigation of its chemical properties [1]. According to theoretical calculations [2], which include so-called relativistic effects, Sg(CO)6 is expected to be slightly more stable than W(CO)6. In this work we aimed at designing an experimental setup for testing this theoretical prediction.
Carbonyl complexes of W and Mo, as lighter homologues of Sg, were chosen for testing the setup. Gas-jet systems as well as the detection system used in our work are described in [1]. Two alpha-active tungsten isotopes were produced in fusion-evaporation reactions 144Sm(24Mg,xn)163-164W, while natZn(24Mg,xn)87-88W allowed for formation of β+-decaying molybdenum. The Gas-filled Recoil Ion Separator (GARIS) provided an effective separation of evaporation residues from the beam and from multinucleon transfer reaction products. Evaporation residues were thermalized in a recoil transfer chamber [3], flushed by a He/CO gas mixture. Formed carbonyl products [4] were transported to a decomposition column, held at different temperatures, and bypassed by a column of the same size made of PFA Teflon. Complexes transported through this bypass or the decomposition column were deposited at the low-temperature end of the COMPACT detector [1] according to their adsorption enthalpy and thus provided quantitative information about the production and the decomposition rates, respectively. Obtained results are discussed in the light of future experiments with Sg(CO)6.

[1] J. Even et al., in preparation , and A. Yakushev, presentation at this conference.
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[3] J. Even et al., Nucl. Instrum. Meth. A 638, 157-164 (2011).
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Session Classification: Chemistry of Actinide and Trans-actinide Elements 1

Track Classification: Chemistry of Actinide and Trans-actinide Elements