Contribution ID: **514** Type: **Invited**

Superheavy Element Chemistry at GSI: Present and Future

Monday, 14 May 2018 13:30 (30 minutes)

The coupling of chemistry setups to an electromagnetic separator is advantageous as this provides the necessary suppression of the primary beam and of products of multi-nucleon transfer reactions, as it was demonstrated in the first study on the carbonyl complex of Sg at GARIS (RIKEN, Japan) [1] and in experiments on Fl chemistry at TASCA (GSI, Germany) [2]. The combination of physical and chemical separation increases the sensitivity in SHE chemistry experiments and allows almost background-free decay-spectroscopy measurements, e.g., with the novel ALBEGA setup [3,4].
Superheavy elements flerovium and nihonium are in the current focus of the chemistry experiments behind TASCA. Recent molecular, cluster, and solid-state relativistic calculations on Cn, Nh, and Fl have been performed and suggest these elements to be more inert than their lighter homologs; however chemical bond formation with gold is still expected [5,6]. In recent experiments, eight Fl atoms were observed in TASCA experiments devoted to the study of the interaction of Fl with SiO2 and Au surfaces. None of them were found adsorbed on the SiO2 covered detector, which was placed upstream to the Au covered detectors for a part of these studies. Five Fl atoms deposited on Au at room temperature, indicating a rather strong interaction with gold. Three Fl atoms, though, were registered at a very low temperature below dew point after transport over the entire gold surface to a thin ice layer. The interpretation of the observed interaction of Fl with Au will be presented.

References

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Session Classification: TAN 1

Track Classification: Chemistry of Actinide and Trans-actinide Elements