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ORAL PRESENTATION - Superheavy element 114 is a volatile metal

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The experimental determination of chemical properties of element 114 (E114) is among the hottest topics in superheavy element research. A first experiment reported E114 to be highly volatile, and to form weak physisorption bonds with Au surfaces [1]. However, the large uncertainties of the measured adsorption enthalpy covered a wide range in volatility, which prevented the experiment from yielding an unambiguous answer concerning the chemical properties of E114. A noble gas-like behavior, representing a break in the trend in group 14 in the periodic table, would be in contradiction to many recent theoretical calculations, which predict a higher volatility and inertness compared to the lighter homolog Pb, but a stronger metallic behaviour compared to Cn [2-4].

We have performed a gas phase chemical study of E114 using a combination of the TransActinide Separator and Chemistry Apparatus (TASCA) to isolate single atoms of E114 [5], and the Cryo-Online Multidetector for Physics and Chemistry of Transactinides (COMPACT) [6], a gas chromatography detector suitable for studying the interaction of single atoms with metallic Au surfaces. The setup allowed studying elements covering a broad range in volatility, from the non-volatile heavy metal Pb to the noble gas Rn, at a very low background level.

In our experiment, the volatility of five elements was studied: the two superheavy elements E114 and Cn ($Z=112$), their lighter homologs Pb and Hg, and the noble gas Rn. Two element 114 decay chains, one from $^{288}114$ and one from $^{289}114$, have been detected and indicate E114 to adsorb on Au surfaces at room temperature [7]. The interaction of element 114 with Au is at least as strong as that of Cn, in contradiction with a previous experiment [1]. Our results show element 114 to be the least reactive member of group 14, but still a metal.

References

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Summary

Primary author(s) : Dr ALEXANDER, Yakushev (GSI Helmholtzzentrum für Schwerionenforschung, Germany)

Co-author(s): Dr GORSHKOV, Alexander (TU Munich); Prof. TÜRLE, Andreas (TU München, Germany); Dr SEMCHENKOV, Andrey (University of Oslo, Norway); Mrs HÜBNER, Annett (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt); Dr LOMMEL, Bettina (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt); Dr KINDLER, Birgit (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt); Mrs SCHAUSTEN, Brigitta (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany); Prof. DÜLLMANN, Christoph (University of Mainz + GSI Darmstadt + Helmholtz Institute Mainz, Germany); Dr HILD, Daniel (University of Mainz); Dr ACKERMANN, Dieter (GSI Helmholtzzentrum für Schwerionenforschung Darmstadt); Prof. RUDOLPH, Dirk (Lund University, Sweden); Dr PARR, Edward (University of Liverpool); Mr JÄGER, Egon (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt); Mr SCHIMPF, Erwin (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany); Dr HESSBERGER, Fritz-Peter (GSI Helmholtzzentrum für Schwerionenforschung + Helmholtz Institute Mainz); Dr ESSEL, Hans G. (GSI); Prof. NITSCHKE, Heino (LBNL Berkeley + UC Berkeley); Dr GATES, Jacklyn M (TU Munich + GSI Darmstadt); Dr KHUYAGBAATAR, Jadambaa (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt); Dr DVORAK, Jan (LBNL Berkeley + UC Berkeley, USA); Prof. KRATZ, Jens Volker (University of Mainz); Prof. OMTVEDT, Jon Petter (University of Oslo, Norway); Dr UUSITALO, Juha (University of Jyväskylä, Finland); Dr EVEN, Julia (University of Mainz, Germany); Mr KRIER, Jörg (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt); Mr RUNKE, Jörg (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany); Dr EBERHARDT, Klaus (University of Mainz, Germany); Dr ANDERSSON, Lise-Lotte (University of Liverpool, UK); Mr NIEWISCH, Lorenz (University of Mainz); Dr WEGRZECKI, Maciej (ITE Warsaw, Poland); Dr SCHÄDEL, Matthias (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt, Germany); Dr BLOCK, Michael (Gesellschaft für Schwerionenforschung mbH); Dr KURZ, Nikolaus (GSI Helmholtzzentrum für Schwerionenforschung, Darmstadt); Dr WIEHL, Norbert (University of Mainz, Germany); Mrs THÖRLE-POSPIECH, Petra (University of Mainz, Germany); Dr GRAEGER, Reimar (TU Munich); Prof. HERZBERG, Rolf-Dietmar (University of Liverpool, UK); Ms FORSBERG, Ulrika (Lund University, Sweden); Dr BRÜCHLE, Willy (GSI Helmholtzzentrum für Schwerionenforschung Darmstadt); Dr QIN, Zhi (IMP Lanzhou)

Presenter(s): Prof. DÜLLMANN, Christoph (University of Mainz + GSI Darmstadt + Helmholtz Institute Mainz, Germany)

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