Contribution ID: **76** Type: **Oral Presentation**

Measurement of the Ionization potential of Lr (Z=103) by online mass separation

Thursday, 14 May 2015 10:10 (20 minutes)

The Isotope Mass Separation OnLine (ISOL) has been developed for over fifty years to study short lived radioisotopes. Since then the technique has diversified and many different facilities have been constructed, with post-accelerators used for nuclear structure studies. In parallel, the field of superheavy element research has progressed with the synthesis and investigation of more than 15 new chemical elements. These elements are produced by heavy-ion induced reactions with actinide targets, where the recoil products are stopped in gas-filled cells. While recoil mass (pre)separators are now commonly used for isotope identification or chemical studies, no heavy elements have so far been investigated exploiting the ISOL method.

Here we present the production of 256Lr (Z=103) radioisotopes, and their identification after formation of an ISOL beam at JAEA, Tokai. A surface ion source has been developed and its operation parameters characterized with a series of radiolanthanides[1]. The conditions were optimized to exploit the low production rates. From the measured efficiencies, it was possible to determine the first ionization potential of Lr at an one-atom-at-a-time production rate. The experimental figure closely matches theoretical predictions obtained using state of the art computational methods[2].

This novel method could possibly be extended for other superheavy element investigations.

References:
[1] T .K. Sato et al, First successful ionization of Lr (Z=103) by a surface ionization technique, Rev Sci Instr 84, 023304 (2013)
[2] T. K. Sato et al, Measurement of the first ionization potential of Lawrencium (element 103), submitted to Nature.

Primary authors: SATO, Tetsuya (JAEA); STORA, Thierry (CERN)

Co-authors: OSA, Akihiko (JAEA); BORSCHEVSKY, Anastasia (Massey Univ, Helmotz inst Mainz); TOYOSHIMA, Atsushi (JAEA); DUELLMANN, Christoph (Helmotz inst Mainz, GSI, JGU Mainz); RENISCH, D. (JGU Mainz); ELIAV, Ephraim (Tel Aviv); RUNKE, J. (GSI); KRATZ, Jens Volker (JGU Mainz); OOE, K (Niigata univ.); TSUKADA, Kazuaki (JAEA); EBERHARDT, Klaus (Helmotz inst Mainz, JGU Mainz); ASAI, Masato (JAEA); SCHAEDEL, Matthias (JAEA); SATO, N. (JAEA); TRAUTMANN, Norbert (JGU Mainz); THOERLE-POPIECH, Petra (Helmotz inst. mainz, JGU Mainz); ICHIKAWA, Shinichi (JAEA, RIKEN); MIYASHITA, Sunao (Hiroshma univ.); KALDOR, Uzi (Tel Aviv univ.); NAGAME, Yuichiro (JAEA, Ibaraki univ.); KANEYA, Yusuke (JAEA, Ibaraki univ)

Presenter: SATO, Tetsuya (JAEA)

Session Classification: Session 12