

**ATOMIC AND CHEMICAL PROPERTIES OF THE HEAVIEST
ACTINIDE ELEMENT, LAWRENCIUM (Lr, Z = 103)**

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The chemical and atomic properties of heavy elements with atomic numbers greater than 100, affected by strong relativistic effects, are studied using advanced techniques to conduct experiments at an-atom-at-a-time scale.

The first ionization potential (IP_1) of an atom, one of the fundamental atomic properties, yields information on the valence electronic structure. Recently, we successfully determined the IP_1 value of heavy actinide elements including lawrencium (Lr, $Z = 103$) by using a surface ion-source installed in the Isotope Separator On-Line (ISOL) at the JAEA tandem accelerator^{1,2}. The experimental IP_1 value of Lr agrees with theoretical calculations that suggest its electronic configuration to be $[Rn]7s^25f^{14}7p_{1/2}$ as a result of strong relativistic effects.

This result motivates us to explore the volatility of elemental Lr because the volatility or adsorption strength on a metallic surface is expected to depend on the type of its valence electronic configuration. Thus, the adsorption behavior of Lr is studied by a newly developed method combining vacuum chromatography with surface ionization in a metallic column/ionizer of the ISOL. A vacuum chromatographic behavior observed using this method can be deduced from the temperature dependence of apparent ionization efficiencies.

Details for the investigations of atomic/chemical properties of the Lr atom will be presented at the conference.

References

1. T. K. Sato et al., Nature 520 (2015) 209-211.
2. T. K. Sato et al., J. Am. Chem. Soc., 140 (2018) 14609–14613.