

## **Chemical investigation of exotic radionuclides**

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From the prediction of atomic and molecular properties to the understanding of the development of our universe, exotic radionuclides are nowadays of great interest in several research domains. Whereas these exotic elements are recent discovered transactinides, or long-lived lanthanides, the study of their chemical and nuclear properties represents a unique challenge. Transactinide elements can only be produced artificially in heavy-ion induced nuclear fusion reactions. The typically low production rates and short half-lives of these elements require rapid and selective chemical setups. This entails that a complete and unambiguous chemical characterization of a transactinide can only be achieved by studying – literally – one atom at a time. Different but no less challenging is the determination of nuclear properties, such as half-lives, of long-lived lanthanides. Besides the scarce availability of certain isotopes (e.g.,  $^{145}\text{Sm}$ ,  $^{154}\text{Dy}$ ,  $^{163}\text{Ho}$ ), special difficulties emerge when samples with a high chemical and isobaric purity are required, or when their decay properties are insufficiently known.

The Laboratory of Radiochemistry (LRC) at Paul Scherrer Institute is in a unique position for studying such exotic elements. PSI owns one of the most powerful proton accelerators worldwide, which feeds the SINQ neutron spallation source. Irradiated material such as collimators, beam dumps, construction materials, etc., represent an extraordinary source of exotic radionuclides, to which LRC has direct access. Furthermore, the decennial collaborations of LRC with international institutes such as FLNR (Russia) and JAEA (Japan) allow for performing state-of-the-art chemical experiments with transactinides.

Here, the latest results on the chemical experiments with the transactinide dubnium ( $Z = 105$ ), in collaboration with JAEA, and the current developments related to the ERAWAST (Exotic Radionuclides from Accelerator Waste for Science and Technology) working program, will be presented.