Institutul Național de Fizică și Inginerie Nucleară
Horia Hulubei

IFIN-HH

Seminar general

Aqueous chemistry of superheavy elements at RIKEN

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Chemical characterization of superheavy elements (SHEs, atomic number $Z \geq 104$) is one of the most important and challenging subjects in nuclear chemistry. It is expected that ionic radii, oxidation states, and chemical bonding natures are largely influenced by the strong relativistic effects on valence electrons in these heavy elements.

At the AVF cyclotron, we produce radioisotopes of Rf ($Z = 104$) and Db ($Z = 105$) in the $^{248}Cm(^{18}O,5n)^{261}Rf$ ($T_{1/2} = 68$ s) and $^{248}Cm(^{19}F,5n)^{262}Db$ ($T_{1/2} = 34$ s) reactions, respectively. Nuclear reaction products recoiling out of the target are rapidly transported by a gas-jet method to a chemistry laboratory. We perform ion exchange, solvent extraction, and precipitation experiments of ^{261}Rf and ^{262}Db using unique rapid chemical separation apparatuses coupled to an automated rapid α/SF counting system. At the RILAC, we have developed a gas-jet transport system coupled to RIKEN GAs-filled Recoil Ion Separator (GARIS) for the heavier SHEs such as Sg ($Z = 106$) and Bh ($Z = 107$). Toward the first aqueous chemistry of Sg and Bh, we have been developing a rapid solvent extraction apparatus coupled to the GARIS gas-jet system.

Radiotracers of Zr/Hf, Nb/Ta, Mo/W, and Ta/Re, which are lighter homologues of Rf, Db, Sg, and Bh, respectively, are useful for model experiments of SHEs. In this seminar, excitation function measurements for quantitative productions of those tracers as well as no-carrier-added chemical procedure to obtain the tracer solutions will be presented.

Luni, 21 octombrie 2019, ora 10^{00}

Sala de seminar Prof. Marius Petraşcu (DFN)