Contribution ID: **1013** Type: **Verbal**

Investigations on the chemical behavior of cesium and iodine in lead-bismuth liquid metal solution

Thursday, 19 May 2022 16:20 (20 minutes)

Lead-bismuth eutectic (LBE) is a eutectic alloy composed of 44.5 at% Pb and 55.5 at% Bi. It is of particular interest as a possible coolant for the Generation IV nuclear reactors and accelerator-driven systems (ADS) given its good thermophysical properties (low melting point, low vapor pressure, and good thermal conductivity) and inertness towards reactions with water and air. However, the behavior of radionuclides present in the coolant, originating from the activation of the liquid metal itself and the potential contamination with fission products, are not well understood. In particular, the release of radionuclides from LBE is a key issue for its safe application and a significant challenge for the licensing of LBE-cooled reactors. In the framework of the "Horizon 2020"PASCAL project, we are interested in the radioisotopes of Cs and I, which are among the most problematic fission products. Compared to the single elements dissolved in LBE, modeling of the chemical equilibrium of the LBE/O/Cs/I system has indicated that Cs and I may show increased evaporation from LBE attributed to the formation of CsI. This thermodynamic prediction needs to be experimentally verified, since it is not evident that the chemical equilibrium required to form CsI will be established quickly.
To address this question, on one side, the solubility of the CsI salt in LBE is determined to get a deeper insight into the quaternary system. On the other side, the species evaporated from I-containing LBE samples, Cs-containing LBE samples and Cs-I-containing LBE samples are investigated through thermosublimatography experiments to verify the formation of CsI in LBE.

Primary author: Dr LIU, Lu (Paul Scherrer Institut)

Co-authors: ZIVANOVIC, Ivan (Paul Scherrer Institut and ETH Zürich); Dr KARLSSON, Erik (Paul Scherrer Institut); HERRMANN, Dominik (Paul Scherrer Institut); VÖGELE, Alexander (Paul Scherrer Institut); Dr NEUHAUSEN, Jörg (Paul Scherrer Institut)

Presenter: Dr LIU, Lu (Paul Scherrer Institut)

Session Classification: Nuclear Fuel Cycle

Track Classification: Chemistry of Nuclear Fuel Cycle, Radiochemical Problems in Nuclear Waste Management