TASCA 26
22nd Workshop on Recoil Separator for Superheavy Element Chemistry & Physics

Statues of chemical investigation of Nh at IMP

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The nihonium (Nh, Z = 113) and moscovium (Mc, Z = 115) are presently in the focus of superheavy elements (SHEs) chemistry studies[1, 2]. According to relativistic quantum chemistry models, Nh and Mc may exhibit higher chemical reactivity than their neighbors, copernicium (Cn, Z = 112) and flerovium (Fl, Z = 114). This increased reactivity results from unpaired electrons in their $7p^{1/2}$ and $7p^{3/2}$ orbitals. Studies on the chemical properties of Nh and Mc have advanced significantly in the past decade. Experiments were performed at JINR and GSI using the Si detector based thermochromatography. However, not a well-defined deposition peaks for Nh or Mc on the quartz surface have been achieved thus far.

The development of heavy ion research facilities in IMP offered us the opportunity to perform experiments on the chemistry of SHEs in China. According to the Monte Carlo simulation results with the adsorption enthalpy of -58 kJ/mol for Nh [3], a temperature gradient from about +60 °C to -60 °C may help us to obtain a clear deposition peak for Nh on quartz surfaces [4]. Therefore, high performance 4H-SiC detectors covered with Si_xN_y layers were prepared to develop the thermochromatography-LEGEND system. The first beamtime experiment using ^{48}Ca ions and ^{243}Am targets were performed at IMP. Then the analysis and characterization of the detector surface morphology, along with subsequent theoretical calculations were conducted.

References

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