

ON-LINE GAS-FILLED SEPARATOR GFS-2 FOR THE DUBNA SUPERHEAVY ELEMENT FACTORY

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Production cross sections of superheavy elements (SHE) with $Z = 112 \div 118$ are in the range of a few picobarns or less. To get access to heavier nuclides and carry out the detailed study on their properties, a sufficient increase in the beam intensity and the development of a separator providing the necessary background suppression are needed. This is the main goal of the construction of a first-ever SHE factory based on the high-current heavy-ion cyclotron DC280 and the new gas-filled separator GFS-2 at the Flerov Laboratory of Nuclear Reactions.

The separator comprises the Q1-D30-Q2-Q3-D10 ion optical scheme. The quadrupole Q1 focuses EVRs in the vertical direction. The dipole magnet D30 with a deflection angle of 30 degrees and a gap of 120 mm focuses the particles by the rotated rear pole face in the horizontal direction. The Q2 and Q3 quadrupoles focus ERs on the focal plane detector. The dipole D10 with a deflection angle of 10 degrees reduces the background from elastically scattered gas atoms, i.e., hydrogen (protons) or helium (alpha-particles).

The separator was designed at the Flerov Laboratory, manufactured by SigmaPhi (Vannes, France) and installed at the beam line No. 3 of the cyclotron DC280 in an experimental hall designed in compliance with class II radiation safety requirements for work with high-active targets made of transuranium isotopes.

During the first stage of testing of the properties of the separator, the detection and data acquisition systems will be studied using the reactions Ar+Dy, O+Pb, and Ca+Pb. Tests will continue using the Ca+Pu and Ca+Am thick targets. Several hundreds decay events of Fl and Mc isotopes are expected to be recorded. After completion of these tests, it is planned to start the synthesis of new superheavy elements with $Z=119$ and 120.