

DEVELOPMENT AND TESTING OF A NEW CRYOGENIC GAS-FILLED CATCHER FOR MASHA

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The mass-spectrometer MASHA (Mass-Analyzer of Super Heavy Atoms) was designed for determination of the masses of superheavy elements. The unique property of this mass-spectrometer is his ability to measure masses of the synthesized super heavy isotopes ($m/\Delta m \sim 1300$) simultaneously with registration of their α -decay or spontaneous fission. The mass-spectrometer is connected to the U-400M cyclotron of the Flerov Laboratory for Nuclear Reactions (FLNR) JINR, Dubna.

Two parameters are very important for the mass-spectrometric investigation of isotopes far from stability: the overall extraction efficiency and the delay time. However, an assembly combining a hot catcher and ECR source allows only ionization of the volatile elements with lifetime at least 1-2 s, thus, strongly limiting the experimental possibilities. In the last several years, gas catchers are widely used for production of radioactive beams and turn out to be more perspective. The main advantages of the gas catchers are namely:

- The technique does not suffer from any dependence on chemical and physical properties of the nuclides whose beams are formed in the catcher.
- It provides an essentially faster extraction time ($\tau \sim 10$ ms) than a hot stopper ($\tau \sim 0.3$ s).
- There is no need of ionization.
- It is possible to reach a high total efficiency for transformation (up to 40%) of the initial nuclear reaction products to a low energy beam for mass-spectrometric analysis.

Assembly of the cryogenic gas catcher for the mass separator MASHA is in progress. At the end of 2011 year it is planned to start the test of the cryogenic gas catcher and use it with MASHA on the beam by the 2th half of 2012.

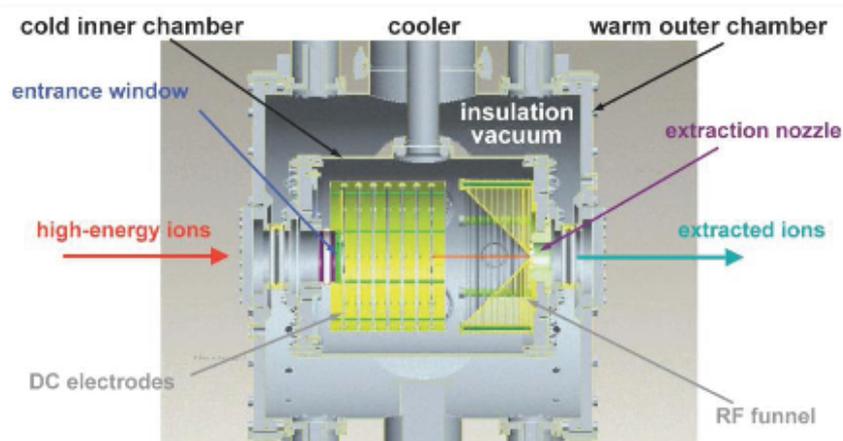


Fig. 1. Cryogenic gas catcher.

Summer practice: Familiarization with experimental setup. Study the papers concerning the gas catcher technique used in heavy ion physics. Active participation in controlling and testing the mass-spectrometer “MASHA” and development the cryogenic gas catcher for MASHA.

Goals: Acquirement of practical experience in preparation the experiments on synthesis of superheavy elements.

Results: Preparation the presentation on gas catchers used in the world for heavy ion physics.

Number of students: 2