

# TASCA 09

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Recoil Separator for Superheavy Element Chemistry

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## Experiment $^{48}\text{Ca} + ^{249}\text{Bk}$ and the Future Plans of Superheavy Elements Investigations in FLNR

A.G. Popeko

*Flerov Laboratory of Nuclear Reactions, JINR, 141980, Dubna, Russia*

In experiments with accelerated ions of  $^{48}\text{Ca}$  isotopes of superheavy elements with  $Z = 111 - 116$  and  $118$  have been synthesized [1].

Synthesis of the element with  $Z=117$  is necessary for producing the data concerning properties of more than 15 new superheavy isotopes which will be observed in decay chains.

The most perspective for synthesis of element  $Z=117$  is the reaction  $^{48}\text{Ca} + ^{249}\text{Bk}$ . This experiment is now running at the FLNR U400 cyclotron using the gas-filled recoil separator in collaboration with Oak-Ridge and Livermore national laboratories in the USA and the Institute for atomic reactors in Dimitrovgrad in Russia. Study of nuclear properties of new isotopes, and of chemical properties of superheavy elements with  $Z = 111, 113$  are planned.

Another alternative is studying of reaction  $^{50}\text{Ti} + ^{243}\text{Am}$ . However, the expected formation cross section of isotopes of element  $Z=117$  will be lower, than in the case of berkelium target. For elaboration of optimum conditions of carrying out of experiments with  $^{50}\text{Ti}$  and heavier ions the significant volume of preparatory researches will be conducted.

"Symmetric" combinations like  $^{86}\text{Kr} + ^{180}\text{Hf}$ ,  $^{136}\text{Xe} + ^{136}\text{Xe}$ ,  $^{136}\text{Xe} + ^{208}\text{Pb}$ ,  $^{150}\text{Nd} + ^{150}\text{Nd}$ , and also reactions of type  $U + U$ , will be studied with the use of combined physical and radiochemical methods.

Realization of the offered program of scientific researches requires:

- modernization of cyclotrons U400 and U400M,
- a new experimental hall,
- new experimental set-ups,
- creation of a high-intensity accelerator of heavy ions.

For investigation of SHE the project of a new gas-filled separator having the optical configuration Q-D-Q-Q-D is prepared.

[1] Yu. Oganessian. J. Phys. G: Nucl. Part. Phys. **34** (2007) R165–R242