

Nuclei from the Islands of SHE

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The talk is devoted to experimental verifications of the theoretical prediction about existence of the “stability islands” in the domain of hypothetical super heavy elements (SHE).

Cold fusion ($^{208}\text{Pb} + ^{50}\text{Ti}$, ^{54}Cr , .. ^{70}Zn) [1, 2] and hot fusion reactions ($\text{Act.} + ^{48}\text{Ca}$) [3, 4] have been used for the synthesis of the heaviest nuclei. They led to the discovery of about 90 new isotopes with $Z=104-118$ and $N=151-177$. The decay properties of synthesized nuclei were compared with the theoretical calculations made in various theoretical models. It is shown that the obtained results provide direct evidence of the existence of the super heavy nuclei, which considerably shifts the nuclear mass limit and expands the Periodical Table of the chemical elements.

The talk presents experimental approaches to the production and study of SHE, with several details concerning registration and identification of rare events as well as prospects for the future program of research.

The experiments were carried out at the UNILAC (GSI, Darmstadt) and at the U-400 heavy ion cyclotron (FLNR, Dubna). The synthesis and studies of the heaviest nuclei in ^{48}Ca induced reactions was performed in collaboration with LLNL (Livermore, USA), ORNL (Oak Ridge, USA), Vanderbilt University (Nashville, USA), PSI (Villigen, Switzerland) and RIAR (Dimitrovgrad, Russia).

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