DISCOVERY OF ELEMENTS 113–118 AND PROSPECTS FOR THE INVESTIGATION OF SUPERHEAVY NUCLEI

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Discovery and investigation of the "Island of stability" of superheavy nuclei (SHN) at the separator DGFRS in the ^{238}U–^{249}Cf+^{48}Ca reactions is reviewed [1, 2]. The results are compared with the data obtained in chemistry experiments and at the separators SHIP, BGS, TASCA, and GARIS. The synthesis of the heaviest nuclei, their decay properties, and methods of identification are discussed. The increased role of shell effects in the stability of superheavy nuclei with rise of their neutron number is demonstrated by comparison of the experimental results with empirical systematics and theoretical data.

At present, the region of known SHN with $Z \leq 118$ and their α-decay descendants forms a relatively narrow "ridge" in the nuclear landscape. In order to more fully understand the role of shell stabilization in this region, it is essential to considerably extend the area of synthesized SHN. Recent achievements and prospects for the production of the heaviest elements are discussed (Fig. 1).

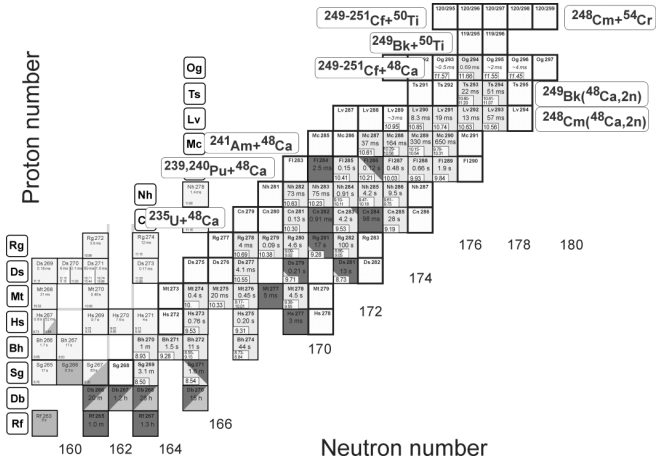

Fig. 1. Summary decay properties of the isotopes of elements with $Z \geq 104$ and $N \geq 159$. The average energies of α particles and half-lives are given for α emitters (grey squares). For spontaneously fissioning nuclei marked by dark grey squares the half-lives are listed. Nuclei synthesized in the reactions of ^{48}Ca with ^{238}U–^{249}Cf target nuclei are shown by more bright colour. New nuclides that could be synthesized in the given reactions are shown by open squares.

1. Yu.Ts.Oganessian, V.K.Utyonkov // Nucl. Phys. A. 2015. V.944. P.62.
2. Yu.Ts.Oganessian, V.K.Utyonkov // Rep. Prog. Phys. 2015. V.78. 036301.