High- Intensity Radioactive Targets as One of the Key Problems in Further Development of the Research Program on Synthesis of New Superheavy Elements

S. Dmitriev

Flerov Laboratory of Nuclear Reactions, JINR, Dubna, Russia

dmitriev@jinr.ru

The study of nuclear and chemical properties of recently discovered superheavy elements (SHE, Z = 112–118) as well as synthesis of new elements (Z>118) remain one of the most crucial tasks in modern science. Over the past decade, the unique results [1] have been obtained that are of utmost importance both in nuclear physics and astrophysics (experimental evidence of the existence of islands of increased stability of SHE) as well as in chemistry (the influence of relativistic effects on the chemical properties of elements 112–114). As per the IUPAC decision, the two new elements are now officially named flerovium (Fl, element 114) and livermorium (Lv, element 116).

All newly discovered superheavy elements belong to the 7th period of the Mendeleev's Periodic Table of the Elements, and the elements 117 and 118 closed it [2].

Further development implies the construction of a first-ever SHE factory at FLNR JINR based on the new DC-280 high current heavy ion cyclotron and cutting-edge experimental set-ups for nuclear and radiochemical studies of superheavy elements.

One of the main challenges nowadays is the development of targets made from radioactive isotopes (^{242,244}Pu, ^{243}Am, ^{248}Cm, ^{249}Bk, ^{251}Cf) which can withstand long-time (≈ 1000 hr) irradiation with the accelerated ^{48}Ca, ^{50}Ti, ^{58}Fe, ^{64}Ni ions (5–6 MeV/nucleon) at the intensity of 10 pμA (6×10^{13} part/s).

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1. Yu. Ts. Oganessian, S. N. Dmitriev. Russian Chem.Review, 78, 1077, 2009.

2. Yu. Ts. Oganessian et al., Phys. Rev. Lett., 104, 142502, 2010.