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# Investigation of the reactions 232Th + 48Ca and 238U + 40Ar on the SuperHeavy Element Factory

The $^{232}$Th + $^{48}$Ca and $^{238}$U + $^{40}$Ar reactions have been studied at the gas-filled separator DGFRS-2 at the Superheavy Element Factory at Flerov Laboratory of Nuclear Reactions, Joint Institute for Nuclear Research. Three new nuclides were synthesized for the first time: a spontaneously fissioning (SF) $^{268}$Sg with the half-life $T_{SF} = 13^{+17}_{-4}$ s; an α decaying $^{272}$Hs with T = $0.16^{+0.19}_{-0.06}$ s and E = 9.63 ± 0.02 MeV; and $^{276}$Ds with $T_{1/2} = 0.15^{+0.10}_{-0.04}$ ms, E = 10.75 ± 0.03 MeV, and an SF branch of 57%. For the first time, in 5n-evaporation channel a new isotope $^{275}$Ds with a half-life of $0.43^{+0.29}_{-0.12}$ ms and α-particle energy of 11.20 ± 0.02 MeV was synthesized in the $^{48}$Ca-induced reaction with the actinide nucleus and identified by measuring correlated α decays ending in known nuclei. The decay properties of these nuclei are in agreement with the systematics of experimental partial half-lives and α-decay energies of heavy known nuclei, as well as spontaneous-fission half-lives. The cross sections of the 4n-evaporation channel of $0.07^{+0.17}_{-0.06}$ pb, $0.7^{+1.1}_{-0.5}$ pb, and $0.11^{+0.46}_{-0.09}$ pb were measured at 231, 238, and 251 MeV, respectively. The cross sections of the $^{232}$Th($^{48}$Ca, 5n)$^{275}$Ds reaction of $0.11^{+0.46}_{-0.09}$ and $0.34^{+0.59}_{-0.16}$ pb were measured at excitation energies of the 280Ds compound nucleus $E^*$ = 51 and 56 MeV, respectively. The cross section of the 5n-evaporation channel of the $^{238}$U + $^{40}$Ar reaction at $E^*$ = 49 MeV of $0.18^{+0.44}_{-0.12}$ pb turned out to be comparable to that for $^{275}$Ds at close excitation energy.

## Section

Nuclear physics (Section 1)

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