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Study of the properties of the superheavy nucleus Z = 117 produced in the ^{249}Bk + ^{48}Ca reaction

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The reaction of ^{249}Bk with ^{48}Ca have been reinvestigated to provide new evidence for the discovery of elements 113, 115, and 117 on a larger number of events. The experiments were performed during April–October, 2012, at the Dubna Gas-Filled Recoil Separator at five projectile energies and with a total beam dose of ^{48}Ca of about 4.6×10^{19}. Two isotopes ^{293,294}117 were synthesized in the ^{249}Bk+^{48}Ca reaction, providing excitation functions and α-decay spectra of the produced isotopes that establishes these nuclei to be the products of the 4*n*- and 3*n*-evaporation channels, respectively ([1] and this work). Decay properties of ^{293,294}117 and of all the daughter products agree with the data of the experiment in which these nuclei were synthesized for the first time in 2010 [2]. The new ^{289}115 events, populated by α decay of ^{293}117, demonstrate the same decay properties as those observed for ^{289}115 produced in the ^{243}Am(^{48}Ca,2*n*) reaction [3] thus providing cross-bombardment evidence. In addition, a single decay of ^{294}118 was observed from the reaction with ^{249}Cf – a result of the in-growth of ^{249}Cf in the ^{249}Bk target. The obtained results are compared with the data from previous experiments aimed at the synthesis of elements 115 [3], 117 [1,2], and 118 [4].

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