Confirmation of super heavy element production in ^{48}Ca induced fusion reactions a handshake of physics and chemistry for element 112

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In 1999 the Flerov Institute for Nuclear Research (FLNR), Dubna, Russia announced the discovery of ^{283}112 and ^{287}114 at the VASSILISSA separator using nuclear fusion reactions of ^{48}Ca with ^{238}U and ^{242}Pu [1,2]. This result started a long series of experiments at the Dubna Gasfilled Recoil Separator (DGFRS) leading to the synthesis of 30 new isotopes of the elements 105 up to 118 (see [3] and the references therein). These discoveries were one of the most important steps towards the "Island of Stability" in the last 20 years. The so far produced isotopes of super-heavy elements show an enhanced stability approaching Z=114 N=184, as predicted about 40 years ago [4]. However, the findings of the very first experiments from 1999 could not be reproduced at the DGFRS [5]. Moreover, experiments at the LBNL, Berkeley, USA and at the velocity filter SHIP at GSI, Darmstadt, Germany were not able to reproduce the discovery claims from FLNR. Therefore, a discussion started about the correctness and reproducibility of the results obtained in ^{48}Ca-induced reactions using actinides targets [6-8].

Here we present two recently performed independent experiments confirming the findings reported from the DGFRS. The first of these experiments was performed at the SHIP separator at GSI applying the primary used nuclear reaction of ^{48}Ca with ^{238}U. Four decays comparing well with the Dubna data were recorded and attributed to ^{283}112 [9]. However, a final prove of the reached atomic number in this experiment was lacking. The second experiment series was performed in 2006 and 2007 at FLNR Dubna aiming at the Z identification of the reaction products by determining its chemical properties. The Insitu Volatilization and Online detection (IVO) technique was used to thermochromatographically assess the interaction of atoms of element 112 with a gold surface. Due to the reported higher production rate the reaction ^{48}Ca on ^{242}Pu was used, leading after the α-decay of the short-lived primary product ^{287}114 to ^{283}112. In total 5 decay chains were detected (partly published in [10]). An adsorption behavior similar to its lighter homologue in group 12 of the periodic table, Hg, was deduced from the observed deposition pattern of ^{283}112 inside the thermochromatographic Cryo-Online Detector (COLD). Therefore, an unambiguously assignment of all observed decays to ^{283}112 is now possible.

The presented data are consistent with the findings at the DGFRS and confirming the discoveries of the elements 114 and 116 [5].

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