Chemical studies of superheavy elements Nh (Z=113) and Mc (Z=115)

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Chemical studies of the odd-Z elements nihonium (Nh) and moscovium (Mc) are currently the hottest topics in superheavy element (SHE) chemistry research. In the past years, Nh and Mc were in the focus of experiments at TASCA, which was used as a physical preseparator to ensure the unambiguous identification of rare decay chains. These elements are predicted to be more reactive compared to their neighbors Cn and Fl [1]. The unpaired valence electron in Nh and Mc renders these more reactive, which leads to several challenges in gas-phase chemistry experiments. They are not as easy to transport to a chemistry and detection setup compared to the closed-shell superheavy elements Cn and Fl, where their adsorption properties on heterosurfaces are studied. A few attempts of the chemical study with Nh have been done, however, without unambiguous results [2-5]. The first Nh chemistry experiment at TASCA was conducted in 2016, using the setup similar to that used in Fl chemistry experiments. No Nh events were observed in this study calling for the development of a new setup, which would be suitable for chemical studies with short-lived and reactive species [6]. We report here on results of the two last SHE chemistry runs at TASCA, carried out in 2020 and 2021 using the setup comprising the new miniCOMPACT and COMPACT detectors. The adsorption studies of Nh and Mc were focused on their interactions with silicon oxide and gold surfaces. During two 3-weeks irradiations of ^{243}Am targets with a ^{48}Ca ion beam, several decay chains were detected that we attribute to originate from ^{288}Mc and ^{284}Nh. The experimental details and preliminary results of these experiments will be presented.

References

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