Towards chemistry beyond moscovium (Mc, Z = 115)

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Chemical studies are a hot and challenging topic in the superheavy element (SHE) research field. The drastically decreasing production cross sections and half-lives with increasing proton number result in a small number of detected events. The chemical study of volatile superheavy elements Cn (Z = 112) and Fl (Z = 114), which have closed electron-shell configurations $6d^{10}7s^2$ and $7s^27p_{1/2}^2$, respectively, were performed on the statistical level of a few atoms only [1-3]. The neighboring element Nh (Z = 113) has one unpaired electron on the valence shell, and thus, should have a higher chemical reactivity, as predicted by recent theoretical calculations [4, 5]. First attempts to chemically study Nh have confirmed its higher reactivity compared to Cn and Fl [6-8] and called for new developments, which would allow to separate and detect short-lived and chemically reactive elements, including Nh, and Mc (Z =115) [8].
However, a significantly faster extraction technique is needed for heavier elements, e.g., Lv (Z = 116) and Ts (Z =117). Here, we present the design, simulations, and the development of a new experimental setup for SHE chemistry, which is based on the compact buffer gas stopping cell UniCell [9] and the miniCOMPACT chromatography and detector system.

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