TASCA Recoil Transfer Chamber Commissioning. 1. Small Image Mode

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One of the main foreseen applications of the gas-filled TransActinide Separator and Chemistry Apparatus (TASCA) [1] recently installed at GSI is its use as a physical preseparator for chemistry experiments [2,3] see configuration shown in Figure 1. As has been described before [4,5] two different ion optical modes are available at TASCA. For both TASCA modes, the Small Image Mode (SIM) as well as the High Transmission Mode (HTM), Recoil Transfer Chambers (RTC) that match the focal plane images and corresponding flanges accommodating the RTC windows [5] have been built. In this report, commissioning of the SIM RTC built at the University of Oslo is described while the commissioning experiments with the HTM RTC can be found in [6].

The SIM leads to an image size of ~(30x40) mm^2 in the focal plane. Correspondingly, an RTC attached to TASCA in this mode can be constructed with a very small volume. This is advantageous for studies of relatively short-lived species with half-lives of only a few seconds or even less, as decay losses occurring during flushing out of the RTC are minimal.

Construction of the interface between TASCA and the RTC, the RTC window and its support structure is described in [5]. The inner diameter of the SIM RTC is only 30 mm, leading to a very small volume compared to RTCs in operation at BGS/LBNL [2], GARIS/RIKEN [8] or the TASCA HTM RTC [6]. The SIM RTC is built in a modular way. Thus, its depth and the gas flow configuration can be changed. Using different spacers allows adopting depths between 10 and 57 mm with the gas entry position to be chosen freely between 5 mm and 22 mm behind the RTC window.

The SIM RTC was commissioned with short-lived Hg isotopes produced in the ^{144}Sm(^{40}Ar,xn)$^{184-x}$Hg reaction. Preseparated Hg atoms were thermalized in a 30 mm deep RTC and transported with a pure He gas flow (2.0 l/min) through a ~13 m long PTFE capillary (i.d. 2.0 mm) to the detection system. The Cryo On-line Multidetector for Physics And Chemistry of Transactinides (COMPACT) [8] was used. It consisted of an array of 32 pairs of Au covered PIPS detectors forming a narrow channel. Hg is known to adsorb on Au surfaces [9]. COMPACT was operated in the isothermal regime at room temperature. The obtained α-spectrum (Figure 2) clearly shows the high separation quality of TASCA in combination with the employed chemical separation system consisting of a pure He jet and COMPACT. Only lines of Hg isotopes and their daughters are visible.

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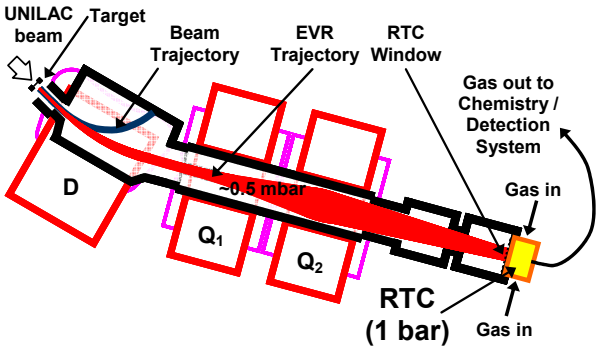

Figure 1: TASCA in the preseparator configuration

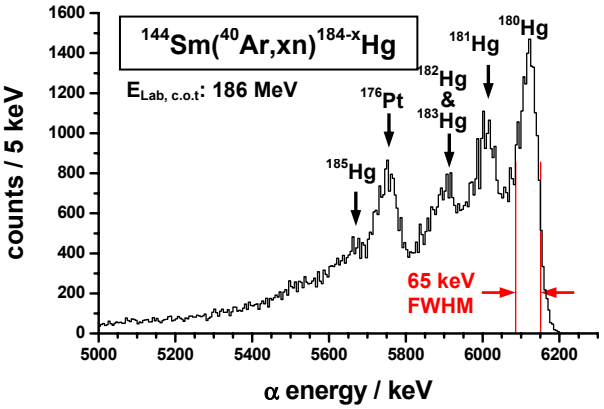

Figure 2: α-spectrum measured with COMPACT [8].

References

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