TASCA Recoil Transfer Chamber Commissioning. 2. High Transmission Mode

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The TASCA separator [1] has entered the phase where the different components are commissioned in dedicated experiments. In 2006, two of those components were the Recoil Transfer Chambers (RTCs) [2] that transfer the species separated in TASCA to a chemistry setup. While the RTC designed for the Small Image Mode (SIM) [3] of TASCA is described in [4], the one constructed for the High Transmission Mode (HTM) [3] is described here.

In the highly efficient HTM configuration, EVaporation Residues (EVRs) are guided into an area of ~(140x40) mm^2 in the focal plane. The HTM RTC (Figure 1) was built at the University of Mainz. It features a modular arrangement that allows easy change of its depth and gas flow pattern. Eight connections are located around the RTC, allowing the investigation of the flushing-out efficiency for different gas flow modes. A catcher foil can be mounted in a position close to the RTC window, thus allowing to measure the activity entering the RTC. The RTC window (140x40 mm^2 area) that separates TASCA's low pressure regime from the high pressure in the RTC was designed and built at the TU Munich, Garching [5].

In the reaction $^{nat}Gd(^{40}Ar,xn)^{\sim194}Pb$, relatively long-lived Pb isotopes were produced and thermalized in a 35-mm deep RTC. A He/KCl gas-jet (1.1 l/min) was used to transport preseparated EVRs through a ~13 m long PTFE capillary (i.d. 1.5 mm) to a radiochemical laboratory. Two different configurations were used: in the first one (configuration as displayed by black arrows in Figure 1), the gas entered the RTC through six gas inlets located around the RTC and left the RTC through the center of the cover. In the second one (Figure 1, light arrows), the gas was swept across the RTC window by entering through three inlets on the left side and leaving through three exits on the right side. Aerosol particles were collected on a glass fiber filter that was placed in front of a low energy photon counter for γ counting.

An unexpectedly low gas-jet yield of only ~15% was measured for both gas flow modes. This could be due to a low particle density or indicate that Teflon is not a suitable tubing material for use with particle gas-jets. Figure 2 shows a γ spectrum taken in these studies. It was obtained by measuring a filter containing preseparated EVRs from a 10 min long irradiation. Acquisition was started five min after the end of bombardment; the counting time was five min. Only γ lines of Pb isotopes and their daughters are visible, proving that all unwanted reaction products are strongly suppressed. This is in contrast to studies with non-preseparated Pb isotopes [6] where dominating γ lines originated from unwanted isotopes such as ^{49}Cr or $^{43m,44}Sc$ produced in reactions of the beam with various parts of the target setup.

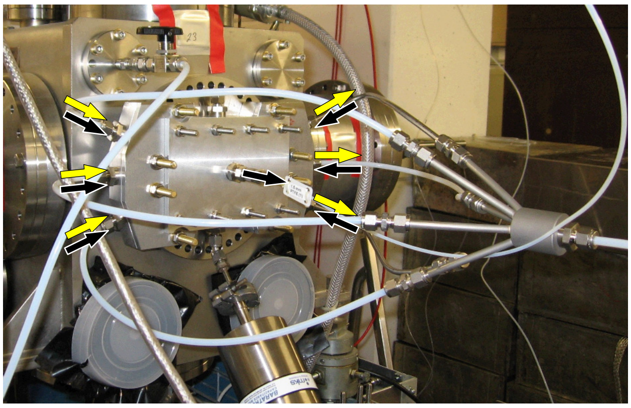

Figure 1: The HTM RTC mounted at TASCA. The two gas flow regimes are indicated by light and dark arrows.

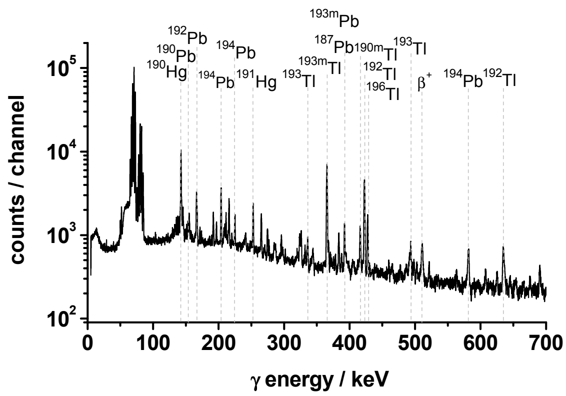

Figure 2: γ spectrum obtained in the commissioning run.

References

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