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1. Hot-lab facility

The hot-lab facility has been further completed by setting up a small cryopumped vacuum chamber in one of the gloveboxes [1], which allows the operation of different, on purpose designed evaporation modules. At present, a micro evaporator [2] for isotopic material of low volatility is installed (fig.1), which is suitable for the preparation of actinide oxide targets from submilligram quantities of source material. It consists of a tubular shaped refractory crucible heated by low-tension electron bombardment, which is sitting in a water cooled case. The distance of the substrate holder from the upper edge of the crucible can be adjusted by means of a screw rod between 4 and 15 mm. The whole assembly is mounted to a stainless steel pedestal to form a mobile evaporation module, which is introduced into the vacuum chamber and is ready for operation after connection to the proper feedthroughs for electrical power and cooling water. For each isotope to be processed, an individual module is used to avoid cross-contamination. Typically, a crucible temperature of 2500 °C can be achieved at a moderate power input of 500 W. This is sufficient to evaporate any actinide oxide. The maximum collection efficiency is 20 %, referring to a substrate distance of 4 mm and a target spot of 3 mm diameter. This implies, that a target of 270 μg cm^{-2} thickness can be made from 100 μg of source material. Since the evaporation module can be operated in any vacuum chamber, all the preliminary adjusting, calibrating and testing can be accomplished with a suitable stable isotope far away from the radioactive control area and without the handicap of a glovebox environment. The first two isotopes to be processed shortly will be ^{244}Pu and ^{229}Th.

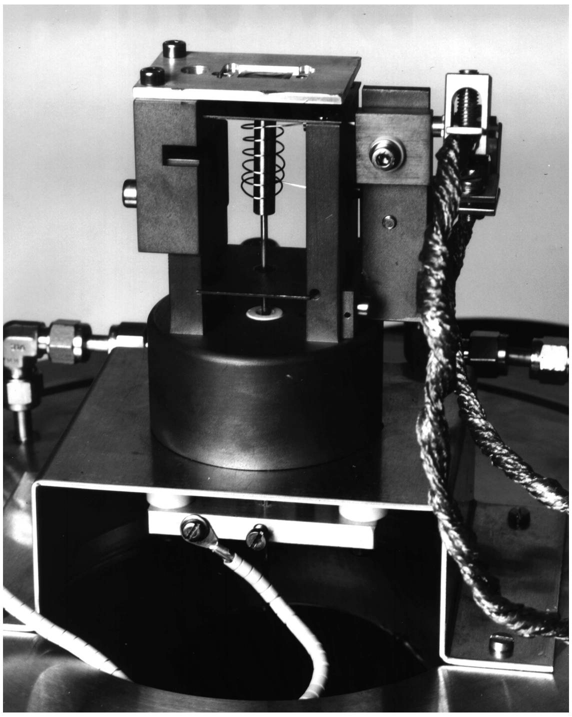

Fig. 1: Micro evaporator for radioactive target preparation

2. Preparation of ^{120}Te targets

Among all Te isotopes, ^{120}Te has the lowest natural abundance of 0.096 %.For the study of low-spin states in ^{119}Te via the ^{120}Te(d,t) reaction [3], ^{120}Te targets of about 100 μg cm^{-2} had to be provided. A very limited quantity of ^{120}Te metal enriched to 99.5 % was available for this purpose. Therefore, a conical crucible of high material economy, which originally had been designed for the processing of highly radioactive material [4], was used for evaporation. Moreover, because of the high volatility of Te, the condensation yield was increased by substrate cooling. A schematic of the evaporation setup is shown in fig.2. The collimating crucible made of pure Ni is heated directly by an alternating current of about 50 A. A copper rod of 35 mm diameter serves as a substrate holder. It is tightly connected to a heat conductance feedthrough consisting of a copper rod of 25 mm diameter soldered to a stainless steel flange with a wall thickness of 0.5 mm. This assembly allows easy and effective substrate cooling down to a temperature of 120 K by heat dissipation into a LN$_2$ reservoir outside the vacuum chamber. Temperature is controlled by a thermocouple located close to the substrate. Cooling of the chamber wall is prevented by the high thermal resistance of the feedthrough flange. Thin sheet (0.63 mm) aluminum oxide ceramics with a thermal conductivity of 20 W m^{-1} K^{-1} was used as a substrate material. In a first step, a thin C layer of 15 μg cm^{-2} was evaporated onto the substrate which had previously been coated with the parting agent betaine monohydrate. Then, the ^{120}Te film was condensed and finally the C/^{120}Te sandwich was floated in distilled water and picked up on a target frame. A high degree of collection efficiency was achieved. Typically, 100 μg of isotopic material were sufficient to form a target spot of 5 mm diameter with a thickness of 100 μg cm^{-2}.

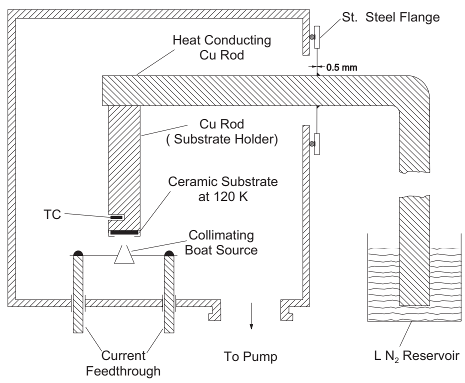

Fig. 2: Setup for ^{120}Te target preparation

References

[1] H. J. Maier *et al.*, Jahresbericht 1993, p. 197
[2] H.J. Maier, Nucl. Instr. Meth. **A397** (1997) 110
[3] D. Bucurescu *et al.*,17
[4] H.J. Maier and R. Grossmann, Nucl. Instr. Meth. **A257** (1987) 11