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1. Preparation of ^{239}Pu targets in the new hot-lab facility

A detailed description of the new hot-hab facility has been given recently [1]. The construction work has been completed in 1996, and the target production equipment was installed early in 1997. After passing the numerous required acceptance tests for the infrastructure and safety devices (ventilation system, water-, gas-, and electricity supply, waste water control and handling, fire-alarm and sprinkler system, glove boxes and hot cell, aerosol and dose rate monitors), the operating license was finally obtained from the Bavarian Department of Environmental Affairs in December 1997. The facility was brought into service shortly after. In a first run, a batch of $^{239}PuO_2$ targets was prepared for a ^{239}Pu(d,pf)^{240}Pu experiment at the Munich tandem accelerator [2]. Since ^{239}Pu is an α-emitter of comparatively low specific activity, it was processed by cold crucible electron beam evaporation in the stainless steel box coater which is permanently installed in one of the glove-boxes [1]. This cryopumped box coater is equiped with two electron beam evaporation sources, each guided by its individual quartz crystal thickness monitor, a resistive heated evporator, and a remote controlled substrate positioner, allowing the deposition of multilayer thin film targets without interrupting the vacuum. The working pressure during thin film condensation is better than 10^{-6} mbar. Isotopically enriched ^{239}Pu in its most stable chemical form of $^{239}PuO_2$ is available from ORNL. Electron beam evaporation of this material resulted in targets consisting of about 30 μg cm^{-2} thick $^{239}PuO_2$ films of high density and smoothness on C backings of 25 μg cm^{-2} thickness. Such targets are well suited for experiments aiming towards the production and spectroscopy of fission fragments. In order to avoid contamination of the target chamber and the beam line by radioactive material eroding from the target during deuteron-bombardment, a protective layer of 10 μg cm^{-2} C was evaporated from the second electron gun source to form C/$^{239}PuO_2$/C sandwich targets.

2. Thick $^{180}Ta_2O_5$ targets for photon excitation experiments

^{180}Ta is one of the rarest isotopes in the periodic table. Its natural abundance is 0.012 %. Isotopic material with an enrichment of 5.45 % is sold by ORNL at a price of 15174.- \$/mg. For photon excitation investigations [3] a thick $^{180}Ta_2O_5$ powder target had to be provided. Since conventional preparation methods like tablet pressing or centrifugation are affected with appreciable material losses, they could not be applied in this special case. Therefore, the target construction shown in fig.1 was chosen. The powder is simply packed into a graphite container consisting of a base and a cover, which are kept together by three aluminum screws. The depression in the base has an area of 1 cm^2. The depth allotted to the material is 0.7 mm, when the cover is drawn tightly to the base, allowing a load of 150 mg $^{180}Ta_2O_5$ to form a target of 123 mg cm^{-2} thickness, referring to enriched metallic Ta. Loading and unloading of the isotopic material can be performed with an average loss of 20 - 50 μg. The isotopic material was received on loan from ORNL.The graphite container is fairly transparent to γ-radiation of more than 50 keV energy.

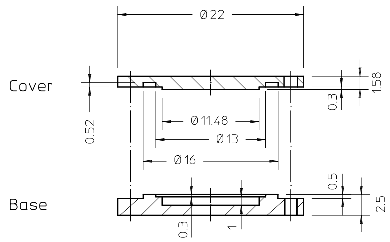

Fig. 1: Graphite target container for ^{180}Ta powder

3. Coating of narrow ceramic tubes with Niob

For the development of a laser ion source for the REX ISOLDE project the internal surface of ceramic tubes of 3 mm diameter and 60 mm length had to be coated with a Nb film of about 50 μg cm^{-2} thickness. This was performed with the setup shown in fig.2. A Nb wire of 0.5 mm diameter is fed through the tube and brought to a temperature causing sublimation by resistance heating. A load at the lower end of the wire provides sufficient tension to keep it stretched in spite of the thermal expansion arising from the heating. A temperature of approximately 2300 °C, which is measured with a ratio pyrometer, is required to attain a reasonable deposition rate. Since this is close to the melting point of Nb, early attempts of evaporation with a hand-operated power supply mostly resulted in an untimely melting of the wire. To overcome this difficulty, a computerized process controller was installed, which uses the signal of the pyrometer to adjust the power supply. This controller allows to run reproduceable heating cycles, and the temperature set point can be observed with an accuracy of ± 10 °C, preventing reliably any overheating of the wire. The sublimation rate of Nb is 67 μg cm^{-2} min^{-1} at 2300 °C.

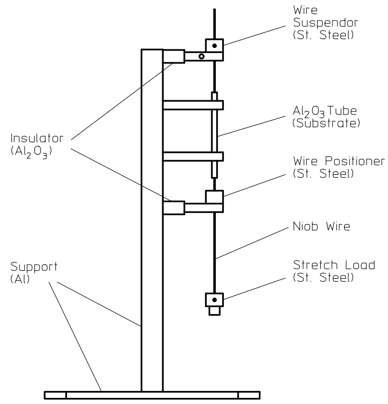

Fig. 2: Setup for Nb wire sublimation

References

[1] H. J. Maier *et al.*, Jahresbericht 1993, p. 197
[2] M. Csatlós *et al.*, this report p. 30
[3] J. Besserer *et al.*, this report p. 22