# Technological Laboratory of the LMU

H. J. Maier, R. Grossmann, H. U. Friebel, and D. Frischke

## 1. $^{180}$Ta targets

Carrying on our recent work, thin film targets of $^{180}$Ta on thin C-backings have been prepared by high vacuum evaporation-condensation. The evaporation module consists in the main of a tube shaped refractory crucible, which is heated by electron bombardment [1]. Its reliability and reproducibility has been enhanced significantly by running it with a computerized control system, which allows automatic adjustment of a specific temperature and maintaining it within a tolerance of $\pm 50\,^\circ$C during the procedure. Calibration of the collection efficiency was performed with $^{nat}Ta_2O_5$, measuring the quantity of Ta deposited on the C-backing by neutron activation analysis. As a rule of thumb, $100\,\mu$g of $Ta_2O_5$ yield a target spot of 2 mm diameter containing $250\,\mu\mathrm{g\,cm^{-2}}$ of Ta in form of $Ta_2O_x$. The right choice of the crucible material is vital for the purity of the target. Only when using a Re crucible, no contamination was detected. Evaporation from a W crucible, for instance, resulted in an appreciable amount of volatile suboxides $WO_x$ on the target, which are formed from $Ta_2O_5$ and W by exchange of oxygen at the hot crucible surface. Using altogether 1 mg of isotopic material, 2 targets of $250\,\mu\mathrm{g\,cm^{-2}}$ and 2 targets of approximately $1000\,\mu\mathrm{g\,cm^{-2}}$ thickness have been made.

## 2. Rare earth targets

The procedure for the preparation of rare earth metals from their oxides by the quartz dome method [2] has been optimized, aiming at the fabrication of targets of the rare and expensive isotope $^{176}$Lu. A gear for the adjustment of the relative positions of crucible and quartz dome has been built, allowing a very precise and reproducible operation. A second measure was the improvement of determination and control of the reaction temperature by using a ratio pyrometer instead of the formerly installed disappearing filament pyrometer. As a result, the average efficiency of the procedure for the production of Lu metal has been increased from 60 to 75 %, and the minimum process stock could be reduced from 150 to 80 mg of $Lu_2O_3$. Metallic Lu won by this method has the shape of a thimble with a typical wall thickness of 10-20 $\mathrm{mg\,cm^{-2}}$ and can be rolled in a dry Ar atmosphere to pinhole-free targets of $1\,\mathrm{mg\,cm^{-2}}$.

## 3. New box coater

A new box-coater has been set up replacing an old device of the year 1975. The stainless steel vacuum chamber with dimensions of $60 \times 70 \times 80\,\mathrm{cm^3}$ and a leakage rate $\leq 10^{-9}\,\mathrm{mbar\,l\,s^{-1}}$ has been manufactured in the machine shop of the LMU at Garching. It is covered with a system of meandering, welded- on water channels to provide heating and cooling. All the ports and flanges including the front door are viton sealed. A cryopump with a port of 320 mm diameter and respective pumping speeds of $12\,000\,\mathrm{l\,s^{-1}}$ for $H_2O$ and $5\,000\,\mathrm{l\,s^{-1}}$ for $N_2$ is connected to the chamber via a bellows sealed gate valve. Roughing is performed by a turbomolecular drag pump in combination with a diaphragm pump, keeping the system completely free from hydrocarbons. The ultimate pressure of $< 10^{-8}$ mbar is reached after pumping over night. The standard equipment for thin film deposition includes a 6 kW electron beam evaporator, a twin resistive heater of 4 kW and a glow discharge substrate cleaning device. On line film thickness and deposition rate control is provided by a quartz crystal oscillator.

## 4. Status of the hot-lab

The conception of the hot-lab (fig. 1) has been described in detail in [3]. During 1995, the construction activities have been continued.

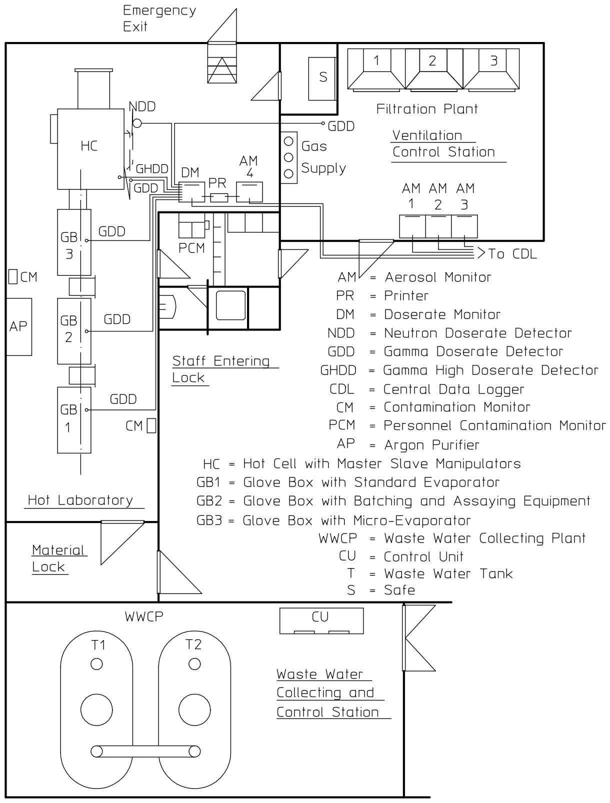


Fig. 1: Floor plan of the hot-lab facility

Of the auxiliary devices, the waste water collecting and control station is ready for use, while the waste air exhaust plant and the radiation monitoring system still have to be completed. The target preparation room is nearly finished. The hot cell and the three glove boxes have been installed recently. Mounting of the target production equipment can not be performed until all the constructional work is done, which is expected for the third quarter of 1996.

### References

[1] H. J. Maier et al., Jahresbericht 1994, p. 223
[2] E. H. Kobisk, W. B. Grisham, Mat. Res. Bull. **4** (1969) 651
[3] H. J. Maier et al., Jahresbericht 1993, p. 199