Laboratory for nuclear targets production

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I. INTRODUCTION

In the years 2000, GANIL needed thin targets for FULIS experiment.

G. Frémont installed a laboratory here and started the production in 2004.

He benefited from the experience of a target laboratory near Strasbourg.

II. LABORATORY

Now, G.Frémont makes targets in a 50m2 room.

Panoramic view

Sep

III. MECHANICAL PREPARATION

Rolling

Two rolling-mills

protection of foil
by stainless-steel foils
and/or
by the atmosphere of
the glove box

µm

Powder pressing

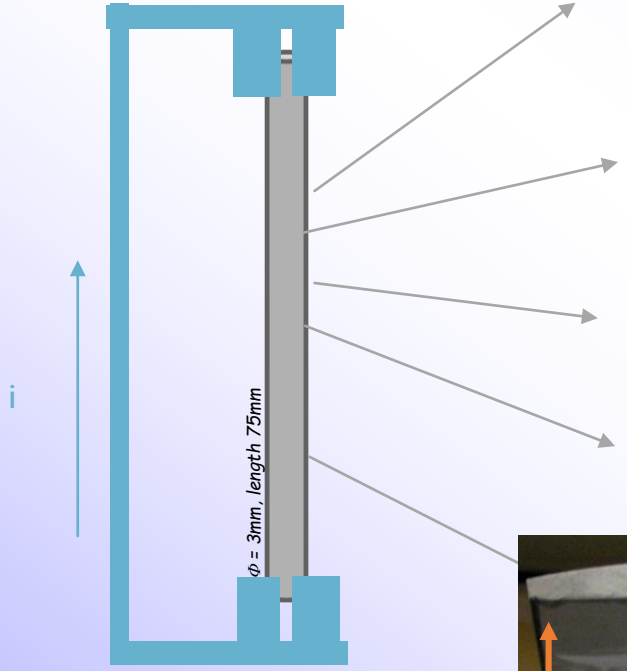
tablets are more easy to melt than powders

IV. CARBON SUBSTRATES PREPARATION

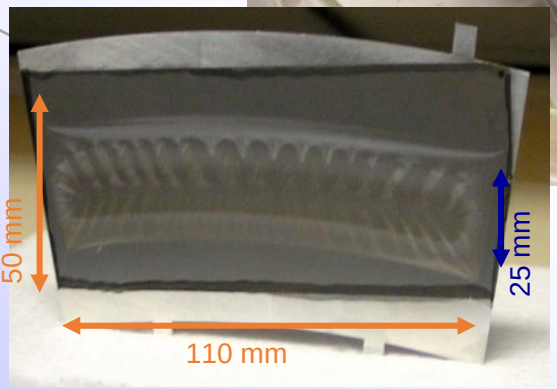
Carbon sublimation

Resistive heating of Carbon

10-100 µg/cm2



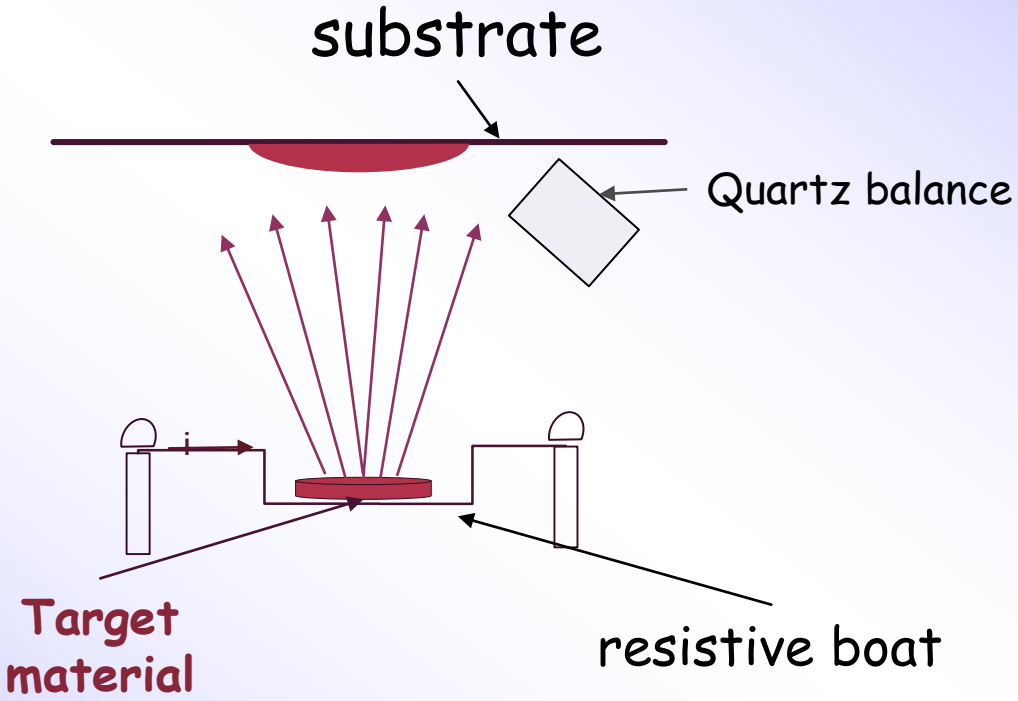
Thin graphite foil



200 nm

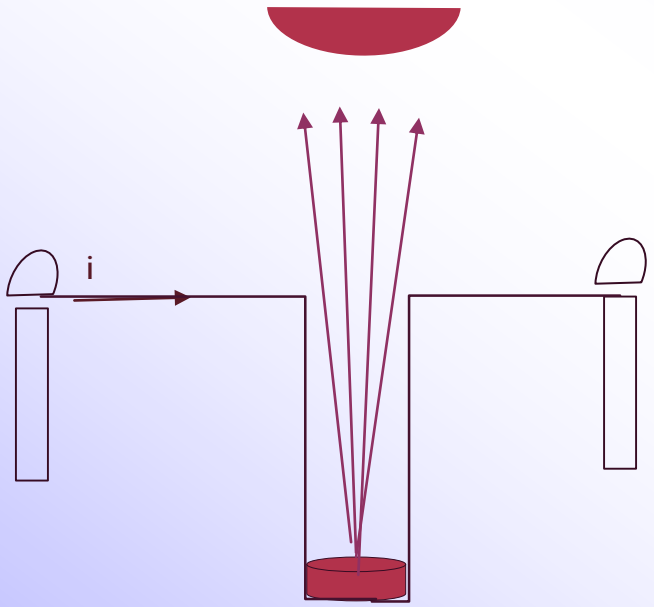
V. MATERIALS DEPOSITION

Thin targets are mainly obtained here by evaporation

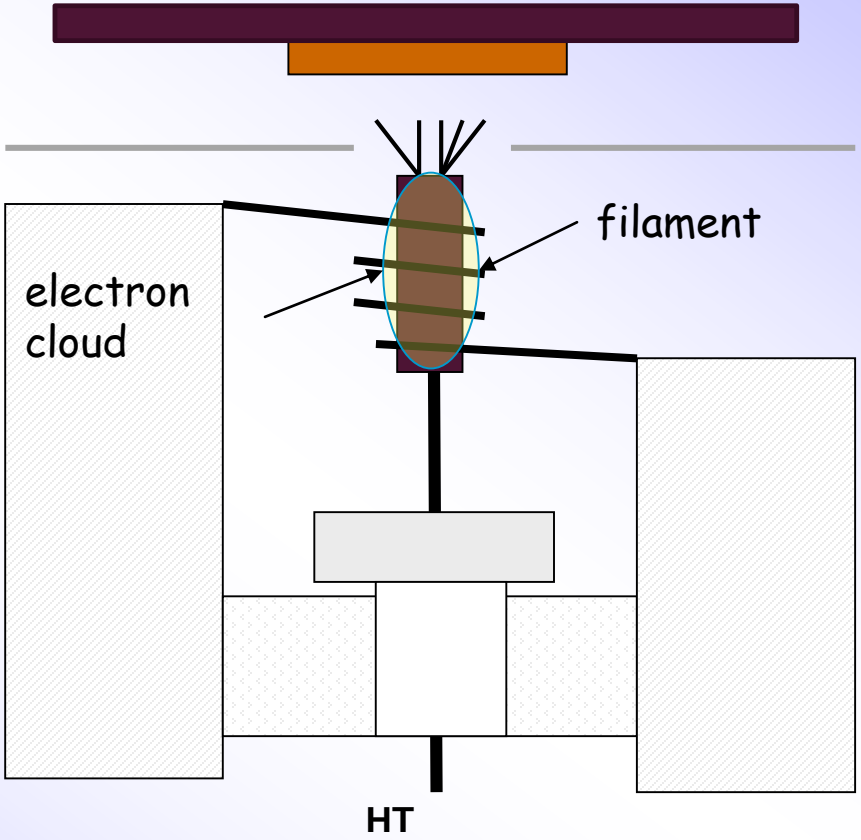


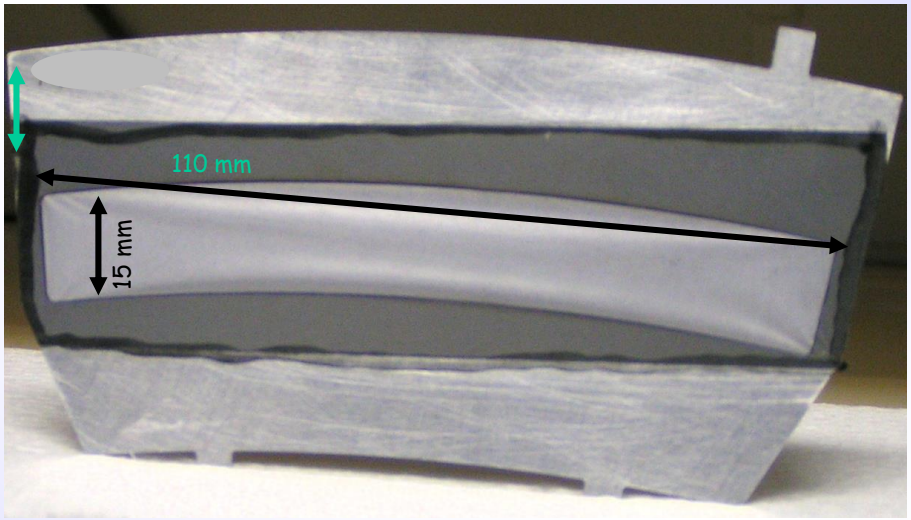
Depending on the material, we can choose particular configurations :

Small crucible for expensive material

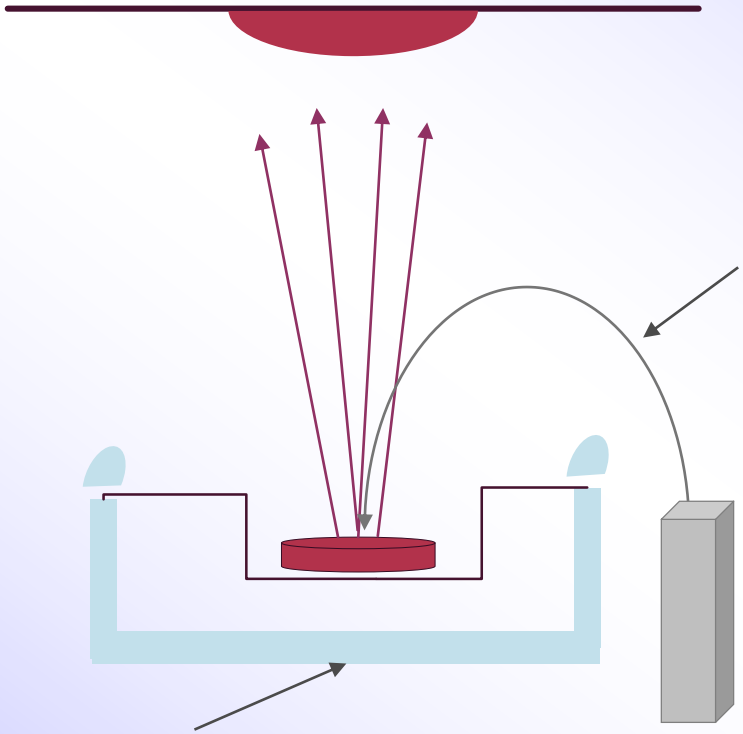


Crucible heating by electron beam for high evaporation temperature



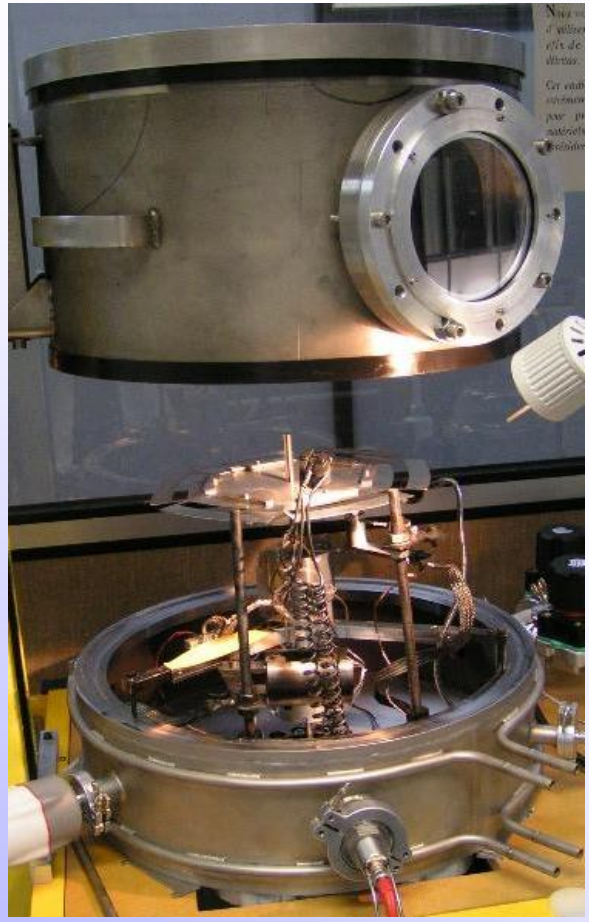

110 mm
15 mm

Direct heating of the material by electron beam for very high evaporation temperature



mainly use to melt powders

Evaporator for medium temperatures



Evaporator with electron beam (3 kW or 6 kW)

Evaporator for large surface

allows fabrication of detector parts

G.Frémont has experience of electro-deposition

Preparation of osmium targets with carbon backing
Georges Fremont, Yvette Ngono-Ravache et al
AIP Conf. Proc. 1962, 2018, 030002-1–030002-4

from $OsCl_4$: Os on Cu foil -> Carbon deposition on Os
-> Cu dissolution

VI. MATERIALS

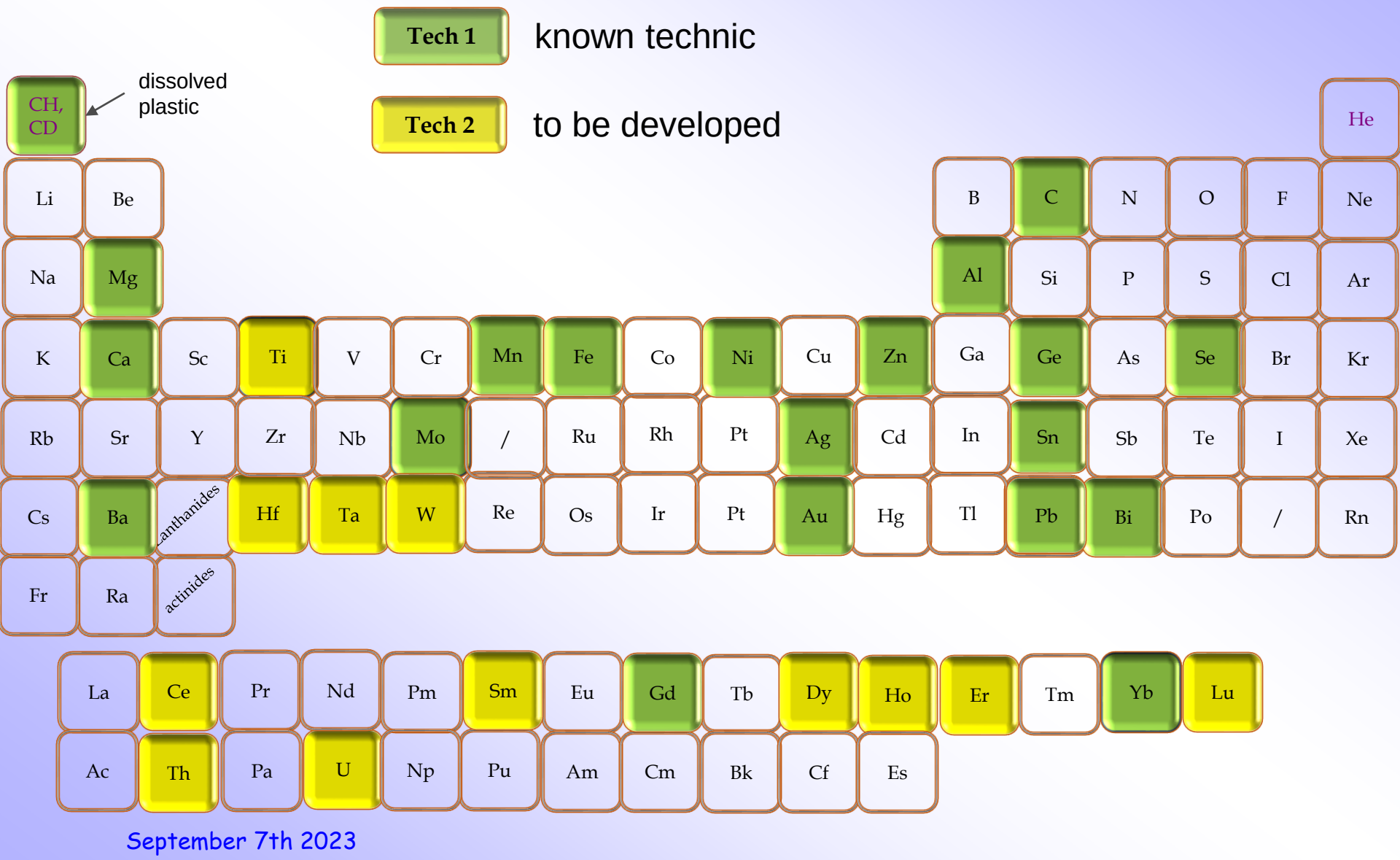
G.F. knows how to fabricate targets using the following materials :

Al, Fe, Ni, Zn , Ge, Se, Ag, Sn, Au, Pb, PbS, Bi, Bi2O3
(in resistive crucible)

Mn, Mo
(in cold crucible, heated by electron beam)

Mg, Ca, Ba, Gd, Yb
(in small crucible heated by electron beam)

Os
(by electro-deposition)



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VII. LABORATORY EVOLUTIONS

The new experimental devices in GANIL (S3, NFS …) demand :

- the increase of target production volume (50 to 500 a year)
- the implemention of other materials

We need :

- new machines able to treat several substrates in one batch. -> 15/day

- new machines for implementing high vaporisation temperature materials (Ta, Re…) -> sputtering

- protections against toxic materials (Pb, Ur, Th…) -> glove box

- protections for targets against O2 and H2O for sensitive materials (Ca, Ur …)

and :

- chemical analyser (X fluorescence)
- thickness analyser (balance, alpha energy loss)
- two other technicians (one started recently)
- new rooms for installing these new machines

Thank you for your attention