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# Preparation of Lanthanide and Actinide Targets for the New GSI Rotating Wheel Target Assembly

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## 1. Target preparation technique

- Molecular plating (MP)
- Deposition cell

## 2. Rotating wheel targets

## 3. Application: chemical investigation of hassium (Z=108)

- Target station at GSI
- Target performance

## 4. Summary

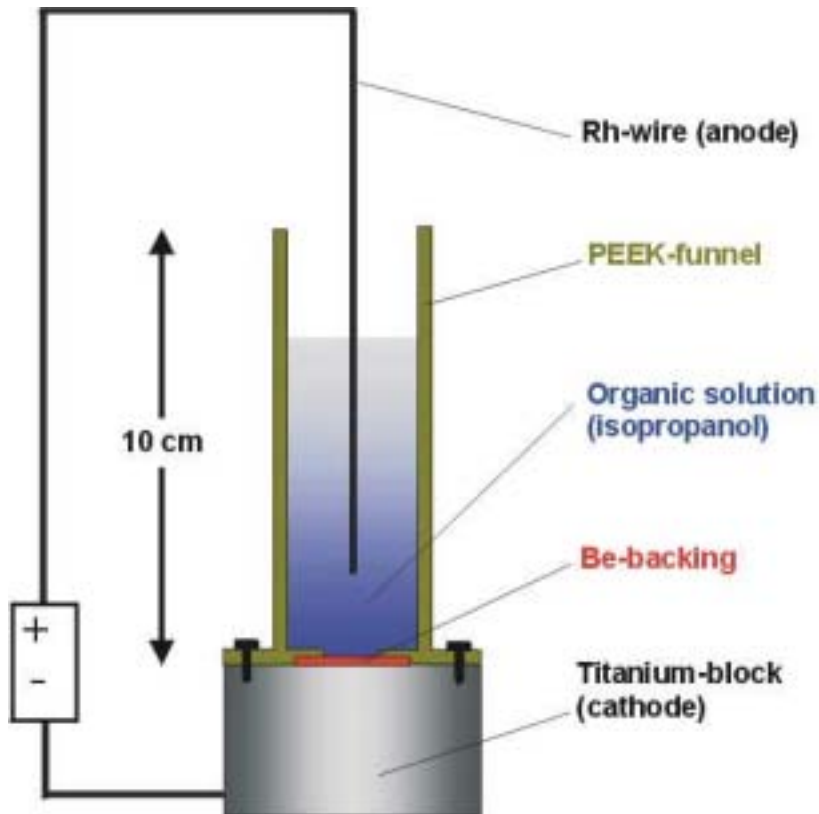
# Deposition of Lanthanides and Actinides

## Molecular Plating (MP)

- Deposition from organic media as a **molecule (nitrate)**
- Solvent: **Isopropanol, -butanol**
- Deposition time: **45 – 90 min**
- Current density: **mA/cm<sup>2</sup>**
- Voltage: **800-1200 V**

**Deposition yield:  $\approx 90\%$**

# Deposition Cell

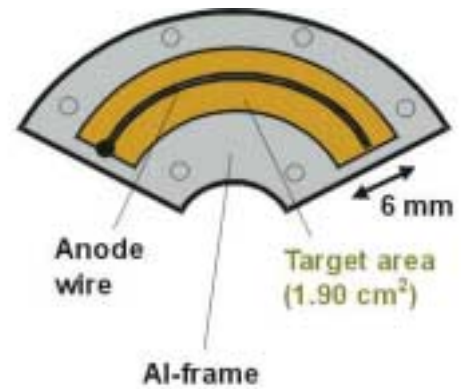


- **Small and simple set-up**
- **Components easy to replace**

In order to avoid cross-contamination for each isotope a particular cell is used

# Target Geometry

- **Banana-shaped geometry**
- **Target area 1.9 cm<sup>2</sup>**
- **Be-backing premounted into Al-frame prior to deposition**



PEEK Funnel



**3 segments form a complete target wheel**

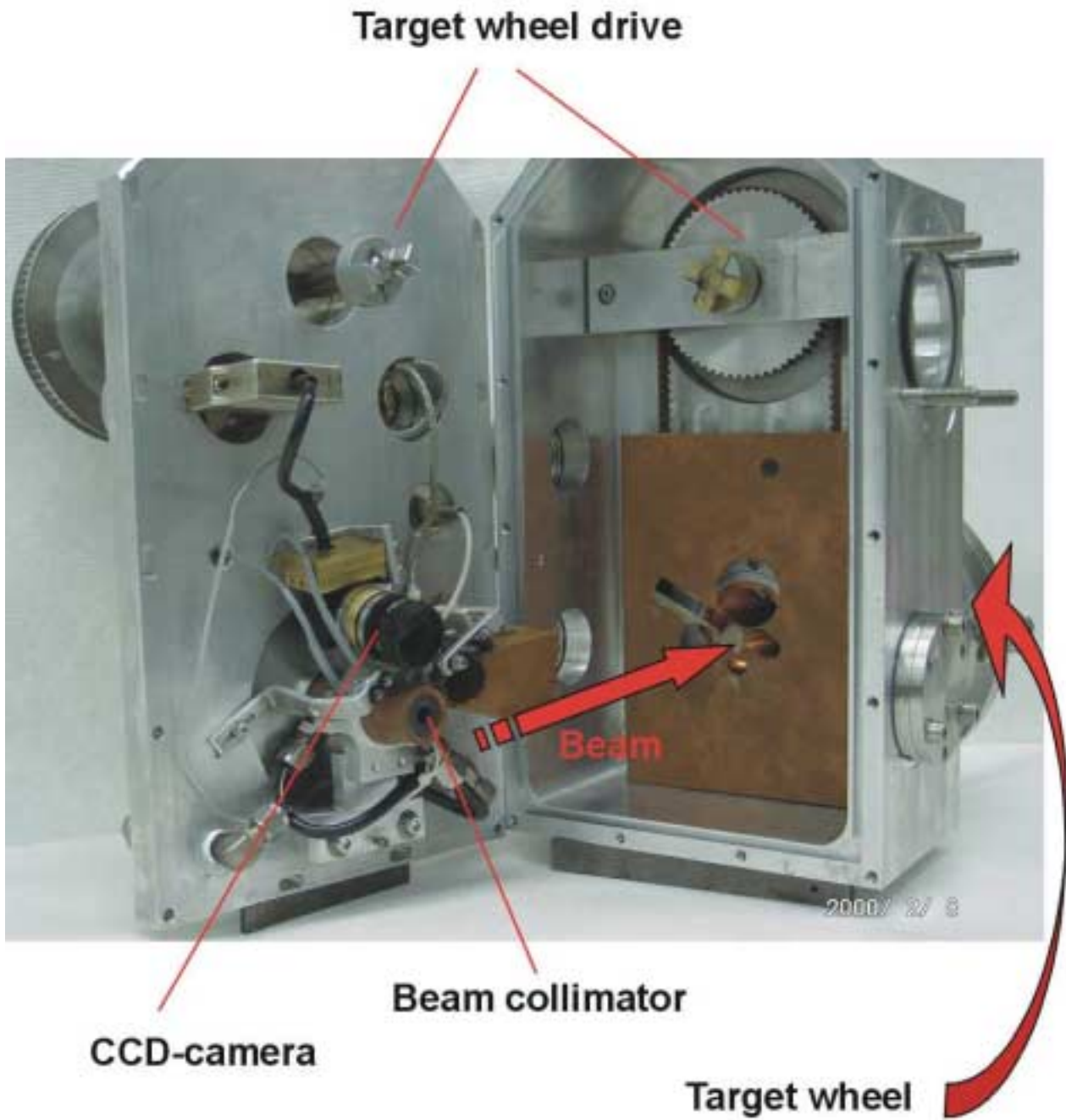
# Rotating Wheel Targets

Isotope	Backing	Thickness [ $\mu\text{g}/\text{cm}^2$ ]
Ba (nat)	Ti / 5 $\mu\text{m}$	400
Ce (nat)	Ti / 5 $\mu\text{m}$	800
Nd (nat)	Ti / 5 $\mu\text{m}$	800
Gd (nat)	Be / 10 $\mu\text{m}$	1100
Dy (nat)	Ti / 5 $\mu\text{m}$	800
Er (nat)	Ti / 5 $\mu\text{m}$	800
Yb (nat)	Ti / 6 $\mu\text{m}$	300
U(nat)/Nd(nat)	Be / 10 $\mu\text{m}$	800
Gd-152	Be / 10 $\mu\text{m}$	800
# Cm-248	Be / 15 $\mu\text{m}$	240
	Be / 15 $\mu\text{m}$	730
	Be / 15 $\mu\text{m}$	690

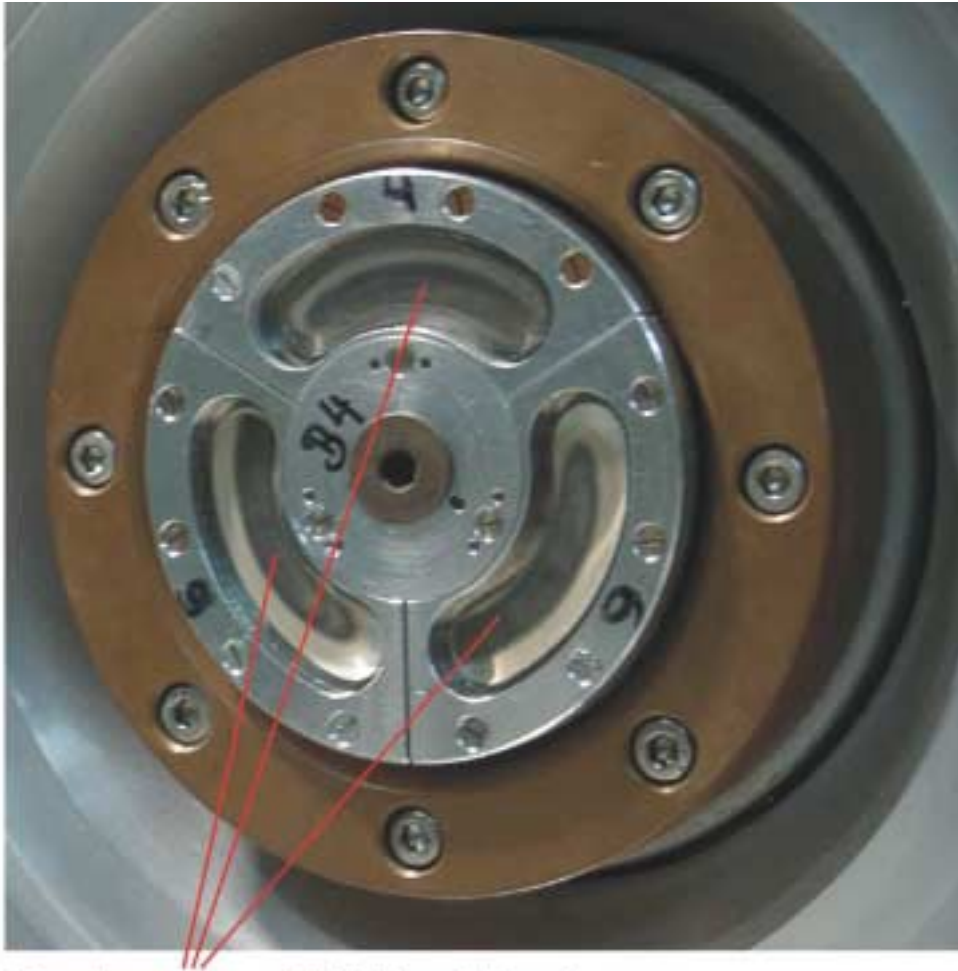
## # Targets for Hs-experiment

**Ti-foil** easier to handle than **Be**  
Target thickness **1100  $\mu\text{g}/\text{cm}^2$**  possible

# "Bird Cage"



# Cm-Targets

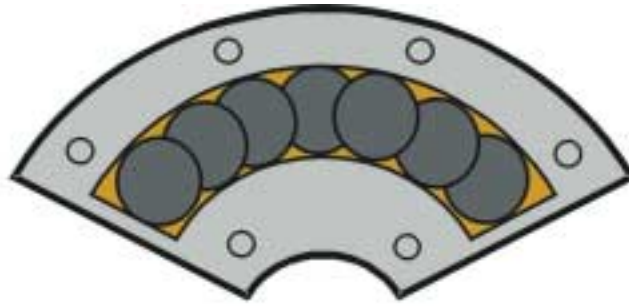


**Dark areas hit by Mg-beam**

- $^{26}\text{Mg}^{5+}$  / 7.41 MeV/u / 50 Hz / 6 ms pulses
- $2.8 \times 10^{18}$  ions during a total 170 h
- Max. **6.8  $\mu\text{A}$**  ( $\approx$  4.0  $\mu\text{A}$  average)
- Temperature Be-window: 190 °C

**Stationary targets: max. 2.5  $\mu\text{A}$**

# Cm-Targets



7 circular segments per target-area

Seg. #	1	2	3	4	5	6	7	Av.
Target								
1	219	239	243	238	236	247	249	239
2	821	757	637	576	694	845	780	730
3	766	685	586	551	627	798	831	692

**Target material not evenly distributed  
over the entire target area**

**No losses during irradiation**



## Summary

- **Production of lanthanide and actinide targets by molecular plating**
- **Target thickness up to 1100  $\mu\text{g}/\text{cm}^2$**
- **Higher beam currents with rotating wheel target compared to stationary target**