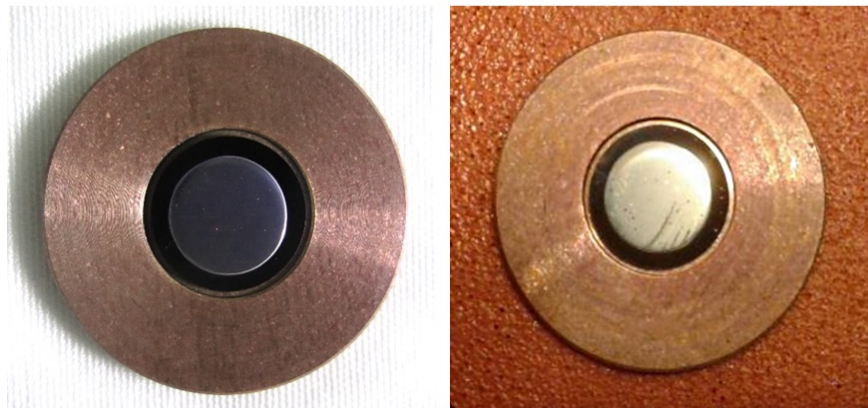


SOLID TARGET FOR RADIOPHARMACEUTICAL PRODUCTION

Cyclotron target irradiation

16MeV p⁺ 60μA (~1kW/cm²) for 30 min



before

after

The increase of the production yield of a radionuclide for medical application is requiring to perform irradiation at high cyclotron currents. In order to support these currents, the cyclotron target should be realized using materials with excellent thermal properties and optimal contact between them. A method to realize a solid target with high level of thermal exchange for the production of ^{99m}Tc by cyclotron was developed. The target is based on a non-metallic inert backing plate with high thermal conductivity. The ultra-thick film of Mo, the precursor for the Tc production, is deposited directly on the backing plate by magnetron sputtering technique.

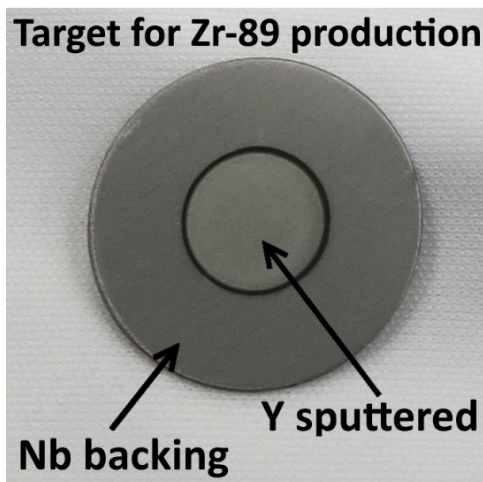
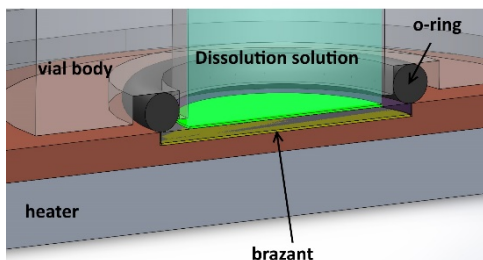
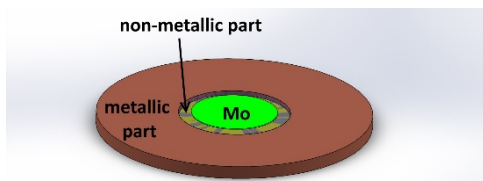
PRIORITY NUMBER:
102017000102990

KEY WORDS:

Cyclotron solid target
Radiopharmaceutical production
Magnetron sputtering
Ultra-thick film
Ceramics-metal brazing
Heat exchanger



SOLID TARGET FOR RADIOPHARMACEUTICAL PRODUCTION



DESCRIPTION :

The target complex backing plate is realized by brazing in vacuum a thin layer of dielectric and chemically inert component to a metallic one with an high thermal conductivity. The deposition of the precursor material (for example ^{100}Mo for $^{99\text{m}}\text{Tc}$ production, ^{89}Y for the production of ^{89}Zr , etc.) is realized through the magnetron sputtering technique in order to obtain a high density and uniformity film with good adherence directly onto the inert substrate. The parameters used for the magnetron sputtering, in particular inert gas pressure, substrate temperature and multilayer deposition, should be optimized in order to minimize the total stress in the system and guarantee extremely high thickness of the film (100 μm -1mm).

ADVANTAGES:

- High thermomechanical resistance of the target;
- Possibility to use high cyclotron current in order to increase the yield of the radionuclide production;
- Inert backing plate guarantees the absence of impurities;
- Complex backing plate brazed in vacuum allows to reduce the costs of the target.

APPLICATIONS:

- ^{100}Mo , ^{89}Y , ^{52}Cr , $^{\text{nat}},^{63}\text{Cu}$ targets for $^{99\text{m}}\text{Tc}$, ^{89}Zr , ^{52}Mn , $^{62},^{63}\text{Zn}$ production;
- Backing plate of solid target for the production of radionuclides at high cyclotron currents;
- Thick films of refractory metals, like Nb for SRF cavities of Cu, otherwise W for graphite components of Tokamak, etc.