TransferTech SHERBROOKE

200-35, Radisson
Sherbrooke QC J1L 1E2
CANADA
t 819 821-7961

SOLID TARGET CARRIER FOR PRESSED TARGETS IRRADIATION AND DISSOLUTION UNIT FOR RADIOPHARMACEUTICAL PRODUCTION

Context

Commercial production of the 68Ge/68Ga generator increased accessibility and kick-started metal radiolabeling of peptides for medical diagnosis. The demand for 68Ga now greatly exceeds the production capacity of generators, and the use of cyclotrons for production of 68Ga by a 68Zn(p,n)68Ga reaction at energies of 12–14 MeV on a larger scale is becoming a necessity. Use of cyclotrons to produce 68Ga first expanded with liquid targets for a yield increase of 10 times generator production, with the convenience of enriched 68Zn recycling and compatibility with existing distribution systems for the liquid targets. However, problems of target density, high pressure, and metal contamination by the targets limit the maximum production quantity and labeling efficiency. The use of solid targets allows much higher yields from 50 to 100 times generator capacity. **However, its spread to different sites is limited by the complexity of target production, the recovery of the solid target while avoiding a high dose for handling, and the complex, expensive systems required for transfers from the cyclotron vault to the units of synthesis.**

TECHNOLOGY

Technology is a magnetic solid target carrier for pressed targets in combination with a dissolution unit used for solid radiopharmaceutical production. After the irradiation in the cyclotron target holder, the target carrier is released down a tube line into a dissolution system. This custom-built system is located in the cyclotron vault and remotely automated by an industrial programmable logic controller. The top portion of the system funnels the target carrier into an air-activated vacuum clamp that opens and closes the magnetic target carrier to release the 68Zn target payload into the polyvinylidene fluoride dissolution chamber. The middle section gates the passage of the target to the dissolution chamber with an air-activated union ball valve (19-mm opening) that seals off the chamber during the target dissolution process. The final portion of the system is the dissolution chamber, where an air/vent port and an air-activated distribution valve (VICI) govern the incoming injections of solutions through the liquid port during the dissolution sequence and selects the destination line of the dissolved target to the proper synthesis unit. **The dissolved target solution arrives about 7 min after the cyclotron irradiation in the destination hot cell. Technology can be used with other radiometals.**

ADVANTAGES

TECHNICAL ADVANTAGES

- They are **used routinely** for pressed target and the productions of 68Ga and 89Zr (over 2000 patients in more than 3 years)
- Offer **yields 50 to 100 times more than generators**
- **Manufacturing cost low** offers great margins for these systems
- **Robust and really secure system** for manipulating radioactive materials

COMMERCIAL ADVANTAGES

- Technology was the featured translational science article of The Journal of Nuclear Medicine in February 2023 (https://jnm.snmjournals.org/content/64/2/232)
- The team behind the technology has received the Honoris Genius – Technological Innovation Award from the Quebec Order of Engineers.

APPLICATIONS

Research Institutions, Hospitals and Medical Centers, Radiology and Nuclear Medicine Departments, Cyclotron Manufacturers.

INTELLECTUAL PROPERTY

TECHNOLOGY READINESS LEVEL (TRL)

- **TRL 6-7, in use for the last 4 years** in a clinical environment, over 1500 patients.
- New upgrades available

INTELLECTUAL PROPERTY

USA and Canadian patents pending

Seeking

- Commercial partner
- Licensing

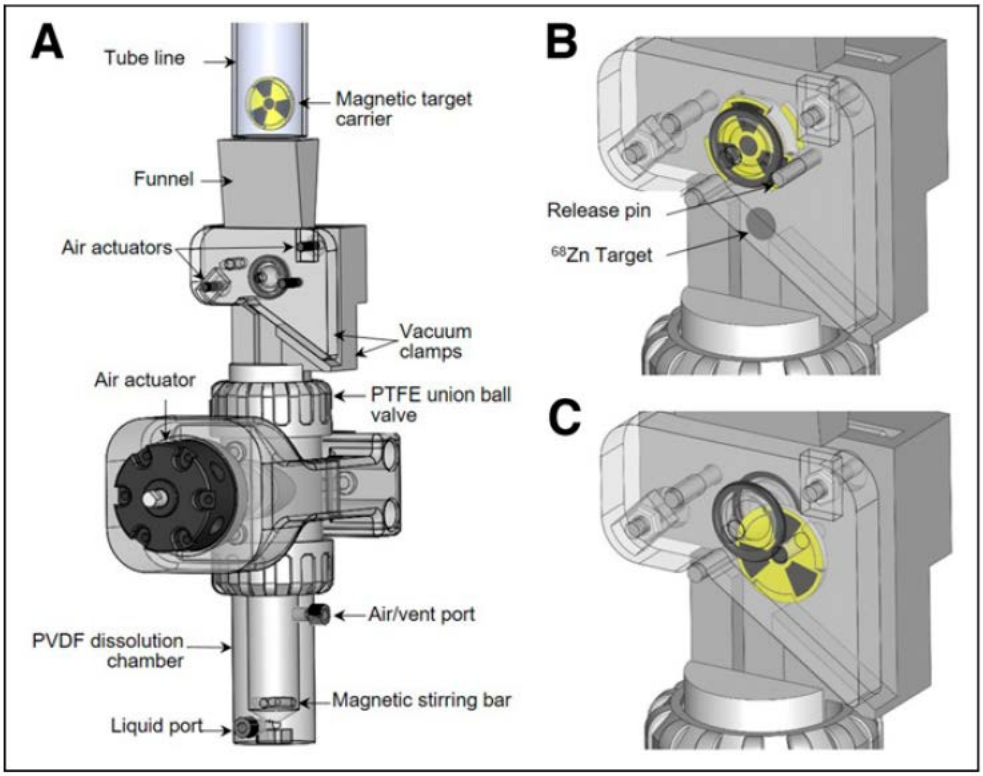
CONTACT TRANSFERTECH SHERBROOKE

Francis Malenfant, Project director
f.malenfant@transfertech.ca
www.transfertech.ca

PROOF OF CONCEPT

Figure 1

Figure 1: Solid Target Carrier System and Dissolution Chamber



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