

Tellurium Alloys for I-123 and I-124 production

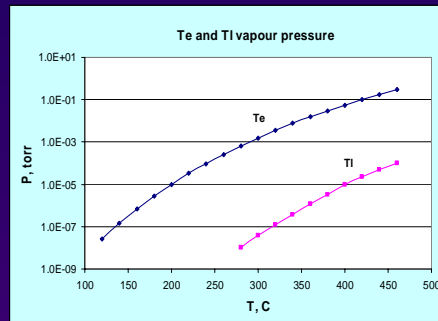
Tellurium forms a variety of intermetallic compounds with melting temperatures significantly lower than that of tellurium. A number of tellurium eutectics (Te/Tl, Te/Tl/Sb, Te/Cu, Te/Ag, Te/Ge, Te/Pb etc.) can be used for the production and *in-situ* extraction of I-123 and I-124.

Elemental Tellurium Targets

- Te m.p. 450°C
- High temperature iodine extraction
- High vapour pressure / High Te loses

Tellurium Alloy Targets

- Lower m.p.
- Liquid metal target / high current
- Low temperature iodine extraction
- *In situ* iodine extraction
- Low vapour pressure / Low Te loses

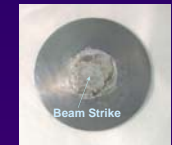


Target Preparation and Iodine Production

- Pure tellurium and thallium melted on a tantalum target holder in Argon atmosphere
- Molten eutectic is pressed into the target holder in order to create a smooth surface
- Tantalum target holder placed into the target assembly
- Irradiation conditions (TR19/9 cyclotron)
 - 16 MeV protons
 - Current 2-5 μ A
 - Σ 50 μ Amin



Target assembly

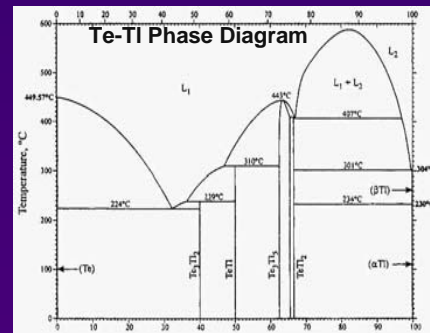


Before irradiation

After irradiation

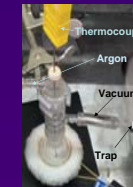
Te/Tl Eutectic

- Lowest melting point among all other eutectics of tellurium alloys, 224°C
- Eutectic composition, 70% Te / 30% Tl, provides 3.5 times more Tellurium than TeO₂ target
- Vapour pressure of Tellurium remains sufficiently low, 1.0E-04 torr at 250°C



Iodine Release

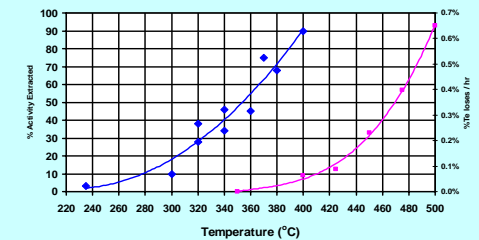
Iodine extracted from molten eutectic in vacuum under a slow flow of argon.



Tellurium losses:

No losses of target material (<0.01%/hr) were observed at temperatures up to 350°C.

Iodine Release from Molten Target in 1 hr



Future Steps

- Explore other tellurium eutectics or other compositions to maximize radioiodine production and extraction
- Measure kinetics of Iodine extraction at various temperatures
- Design a liquid Te alloy target for *in situ* extraction of I-123 and I-124

Acknowledgements

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