

TARPIPE: TARget Prototype Irradiations at PSI for EURISOL

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The selection of target materials for the production of radioactive nuclear beams is made on the basis of several criteria that include the production cross-sections for isotopes of interest, diffusion, effusion, ageing and heat dissipation. Optimal target materials are often the result of compromises between these properties, which must be preserved under damaging operation conditions. A programme of irradiation and analysis of typical and novel prototype materials for the EURISOL 100 kW direct targets is currently underway. Materials under study will include SiC, Al₂O₃, SiO₂, C and Ta in a variety of forms, such as mesoporous or nanostructured samples, foils, foams and carbon nanotubes. The test jig for irradiation will hold 4 target containers, each of which with the capacity for 6 prototype pills. The containers will be made of either graphite or molybdenum to ensure chemical compatibility with the test samples. The test jig is designed to interface with the LiSoR experimental stand where the irradiations will take place, at the 72 MeV Phillips proton cyclotron facility at PSI. Extensive simulations were carried out to design the test jig, with energy deposition and heat dissipation in the pills and target containers and the dimensioning of a suitable beam dump being addressed. The radioactive decay of the beam dump was also investigated. Each of the target containers will be irradiated in turn under carefully tuned irradiation conditions, until the requisite irradiation damage is induced in the test samples. Post-irradiation analyses will be carried out at the PSI hot cell facility.

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