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Design of high temperature ISOL targets

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In the facilities for the production of radioactive ion beams based on the isotope separation on line (ISOL) technique, the target system is surely one of the most critical objects. Thick targets are widely used worldwide and they operate mainly in combination with high energy high intensity protons. High intensities are usually necessary to fulfill the most important target requirement, that is to produce as much isotopes as possible.
In the specific case of the selective production of exotic species (SPES) facility, a uranium carbide target is impinged by a 40 MeV, 200 µA proton beam produced by a cyclotron proton driver. Under these conditions, a fission rate of approximately 10^13 fissions per second is expected. The target is composed of seven uranium carbide co-axial disks (closed inside a cylindrical graphite box), appropriately spaced in the axial direction in order to dissipate by thermal radiation the considerable amount of power deposited by the proton beam. The average working temperature is around 2000℃ with the aim to enhance both the diffusion and the effusion processes for the produced isotopes. Sophisticated heating systems were adopted to satisfy the aforementioned thermal specifications, and an integrated electrical-thermal-structural design was required to obtain a reliable target system for long term operation at high temperature.
In the worldwide ISOL scenario other interesting and prestigious target architectures were developed, and they are constantly updated and improved by dedicated working groups of physicists and engineers.
In this work all the aforementioned points will be accurately described and commented, together with a general overview on new or recent developments for high power ISOL targets.

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