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Compact Sealed lithium target for accelerator-driven BNCT system

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An accelerator-based neutron source for Boron Neutron Capture Therapy is under developing with a combination of a DC accelerator (IBA Dynamitron, 2.8MeV, 15mA) and a compact sealed lithium target. Low energy protons incident on lithium target are one of the most suitable reaction for accelerator-based BNCT. However, metallic lithium has several difficulties in chemical properties (low melting point, high chemical activity and 7Be production) as a target material. For resolving those issues, we are developing a compact and sealed Li target. The sealed lithium target contains a thin lithium layer (2mm) between a thin titanium foil and an embossed structure on a tantalum base plate. Then, the liquid lithium and radio isotopes (Be-7, T) can be confined in the target. The low-energy and high current proton beam is passing through a titanium foil and irradiated to the lithium layer. Such a high beam flux (More than 7MW/m2) can be removed by a strong turbulent flow arose with ribs in cooling water channels of the target.
Neutrons with the energies of less than 1MeV are produced due to the 7Li(p,n)7Be reaction by the irradiation of the 2.8MeV proton beams and could be moderated using a compact beam shaping assembly to meet all the conditions indicated in the IAEA-TECDOC-1223. Sealed lithium target will be replaced routinely after cancer treatments of more than one hundred by a remote handling system.
We are constructing a compact accelerator-driven neutron source in the Nagoya University and confirm the practical reliability of the sealed lithium target for the BNCT application.

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