

Behavior of proton beam window materials of high power spallation targets

A proton beam window is an important component in a spallation target. It guarantees the safe operation of the target, since its failure may cause severe contamination of the proton beamline and lead prolonged shutdown of the neutron source. A proton beam window is the component exposed to the highest proton beam current or intensity in the target. The high proton beam current density in a MW-class targets leads to a high radiation damage rate (dpa rate) and high heat deposition in the beam window material. Therefore, high radiation damage resistance and good thermomechanical properties are the basic requirements for beam window materials. If the beam window is water cooled, water corrosion resistance also needs to be considered. Whereas the structure of a beam window is greatly affected by thermal stress, the lifetime of the window is mainly limited by the level of radiation. In this presentation, the behavior of existing high power spallation target beam window materials such as Al-alloys AlMg3 and Al6061-T6, Inconel718, and stainless steel 316L after irradiation will be described. The pros and cons of their applications will be discussed.

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