Contribution ID: **1** Type: **Talk**

Tungsten as Spallation Neutron Production Target Material

Monday, 2 September 2019 15:10 (20 minutes)

Tungsten is a good candidate material for spallation neutron production, which is driven by high energy proton beam. It has a high atomic weight and mass density which result in a high neutron yield, and can take intense proton beam thanks to its high melting point, high thermal conductivity and low physical sputtering yield. However, tungsten suffers from drastic degradation of its mechanical and thermal properties under primary proton and secondary neutron radiations already at above 0.1 dpa.

Pure tungsten has been chosen at European Spallation Source (ESS) as spallation target material. The tungsten will be irradiated by a 2 GeV pulsed proton beam with 4% duty factor. Each of 2.86 ms long beam pulse repeated at 14 Hz delivers 357 kJ to the spallation volume, causing temporal temperature increase of up to 100 oC in tungsten. A time averaged beam current of 2.5 mA induces a high radiation damage at a rate of up to 2 dpa per year. It is therefore important to understand the long-term radiation damage effects on tungsten, for a reliable operation of the target.

In order to support the ESS target design, an intensive research program has been executed to study the characteristics of tungsten which is subjected to particle radiations, in collaboration with PSI, Lund University, Darlana University and GSI. In this talk, we present the summary of findings obtained from this research program, which covers the studies of fatigue properties of unirradiated tungsten from various processing routes, characterization of the oxidation behaviour of tungsten in mildly oxidizing, irradiation induced changes in thermal diffusivity, hardness, ductility, and ultimate tensile strength. The obtained results should be valid not only for ESS target but also for other high-power tungsten targets in planning and in operation.

Poster back-up

No

Primary authors: LEE, Yongjoong (ESS); DAI, Yong (Paul Scherrer Institut); HABAINY, Jemila (LTH); Prof. IYENGAR, Srinivasan (Lund University)

Presenter: LEE, Yongjoong (ESS)

Session Classification: Talks

Track Classification: Neutron Production