Seminar

Institute for Plasma Research

Title : Optimization of design parameters for Tritium Breeding Blanket Module

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Time : 10.30 AM

Join the Talk: https://meet.google.com/zdm-nfrm-nxb

Abstract: Current design of the Indian solid breeder blanket known as HCSB (Helium Cooled Solid Breeder) blanket is having Reduced activation Ferritic/Martensitic Steel (RAFMS) as structural material. Lithium Meta-Titanate (Li_2TiO_3) and beryllium are used as tritium breeder and neutron multiplier respectively in a pebble bed form. This work focusses on the use of advanced materials like titanium beryllide ($Be_{12}Ti$) as neutron multipliers instead of pure Be which has many advantages as cited in many literatures which include higher operating temperature limit and lower volumetric swelling due to irradiation. Present design of solid breeder blanket has cooling plates for cooling the internals of blanket. Here we are proposing a cooling tube concept instead of plates.

The current wok involves studying the thermal hydraulics by replacing the separate zones of breeder and Neutron multiplier i.e. Lithium meta- titanate and pure Be with a mixed pebble bed of Lithium meta- titanate and titanium beryllide and also replacing the cooling plate with cooling tubes to minimize the structural material and increase the functional material. The cooling tube concept seems to have better control on the cooling requirements over the desired regions in the pebble bed. It is also easy to fabricate cooling tube instead of plates which require complex HIP process. The temperature of bed should be higher for better tritium release which is possible using a mixed pebble bed with titanium beryllide as neutron multiplier since it has higher temperature limit. Using cooling tubes concept, temperature can be controlled wherever required while keeping it below the maximum allowable limit for the functional as well as structural materials. This study thus involves studying the thermal hydraulics of the blanket module in the mixed pebble bed by optimizing cooling tube and other components like breeding modules First Wall and manifolds using different analysis including thermal-hydraulics, and CFD analysis to support the design and performance of blanket components.
