Contribution ID: **272** Type: **Poster**

NUMERICAL STUDY OF INTERATION BETWEEN THERMAL STRESS OF THE FIRST WALL AND COOLANT DUCT BY LIQUID-SOLID COUPLED METHOD IN FUSION REACTOR BLANKET

Tuesday 6 June 2017 13:40 (2 hours)

The He-cooled Lithium Lead breeder blanket could be developed with the utilization of relatively mature material technology, which is used by Reduced Activation Ferritic / Martensitic (RAFM) steel as the structural material in China. It is necessary to analyse the first wall structure heated because of the thermal stress from two coolants in the blanket which would directly affect the blanket life and the safe operation coefficient, and indirectly carries on affection of the enhancement of thermal efficiency from electricity generation.
The helium flow in the First Wall and LiPb flow with a transverse magnetic field in vertical channels in the blanket are investigated. The specially numerical MHD code based on the CFD software has been developed for analysis of the LiPb flow. The helium flow with four kinds of design scheme have been calculated and simulated. The three-dimensional temperature distributions of the LiPb flow in heating duct have been given. The analysis of the flow field and temperature gradient in the boundary layer of the duct have been performed. The heat transfer boundary condition of helium flow duct was determined by means of liquid-solid coupled method. The analysis for the structural stresses of the LiPb flow channel have been performed. The effect of the ratio of thermal load on the heat transfer characteristics of the helium and LiPb flow have been calculated and performed.

Eligible for student paper award?

No

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Session Classification: T.POS: Poster Session T

Track Classification: Blankets and tritium breeding