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Design and optimization of the CFETR breeding blanket with S-type cooling pipes in BU

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Three concepts of tritium breeding blanket have been proposed for Chinese Fusion Engineering Test Reactor (CFETR). One of the concepts is helium-cooled ceramic breeder (HCCB) blanket. The HCCB blanket have the S-type cooling pipes in breeding unit (BU), and the BU consists of lithium ceramic pebble beds and beryllium pebble beds. The breeding material and the multiplier material separated by the cooling plates. Theoretical calculations has been done to obtain temperature distribution and pressure drop for the preliminary design of the breeding blanket.Then ANSYS CFX is employed to verify the thermal performance of the first wall (FW) in radial-toroidal and poloidal-toroidal directions. The temperature distribution in FW is obtained and the optimization of cooling channels is proposed according to the simulation results.Finally, according to the temperature distribution,structural stress analysis has been done to verify the feasibility of the design.

Eligible for student paper award?

Yes

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