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3D numerical simulations of hypervapotron geometry on Thermalhydraulic Performance

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In order to satisfy the EAST first wall and divertor upgrade plan, a hypervapotron (HV) cooling concept is chosen to be developed as a candidate for the design of PFCs. The HV structure relies on internal grooves or fins and boiling heat transfer to maximize the heat transfer capability. The fabrication technology of W/Cu divertor has been developed at ASIPP (Institute of Plasma Physics Chinese Academy of Sciences), and one W/CuCrZr/316L HV component will be fabricated for high heat flux tests. Before fabrication, the relevant analysis was carried out to optimize the structure of HV component element. In this paper, numerical simulaitons with a 3D model of 490 mm × 50 mm × 20 mm have been performed using the CFD (computational fluid dynamics) analysis by means of ANSYS FLUENT code. In the model, W tiles with thickness of 2mm were selected as armor tiles considering that 2-mm-thick W tiles are being used in EAST upper divertor. And two fin designs were compared for optimization, then the advantages of slots on the fins were also discussed. Besides, several width and shapes of the groove between the fin and the side wall were also compared. And for each design, the comparison between subcooled boiling and single phase convection has been carried out, as well.

Eligible for student paper award?

Yes

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