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Thermo-Hydraulic Performance Testing for Plasma Facing Components by 3D Metal Printing Technology

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3D metal printing technology was selected for the development of fusion divertor research, and the optimization of thermo-hydraulic performance with a water cooling in a Korean heat load test facility by using electron beam (KoHLT-EB). The various cooling design for ITER and DEMO divertor have been fabricated for the enhancement of cooling performance, such as swirl tube and hypervapotron. The main target of this work is the overcoming of fabrication limitations in such cooling devices and the development of new cooling mechanism by using 3D metal printing. And 3D printed divertor mockup was designed and fabricated based on the optimization of 3D cooling structure. The high heat flux test facility KoHLT-EB was used to evaluate the enhancement of cooling capacities. KoHLT-EB was modified in water cooling system for the performance test and the experimental evaluation of the divertor mockups. High heat load for the divertor mockup was applied up to 10 - 20 MW/m². Also, Thermo-hydraulic and thermomechanical analysis with ANSYS-CFX were performed to determine the test conditions and performance of 3D printed mockups. Present research results will contribute the development of Korean fusion reactor and DEMO program.

Eligible for student paper award?

No

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