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Neutronics and thermomechanical analysis of a conceptual shielding blanket for CFETR

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The conceptual design of Chinese Fusion Engineering Reactor (CFETR), which will be operated in two phases has been proposed to fill the gap between ITER and DEMO plant [1]. In order to maintain the performance of Vacuum vessel (VV) and external machine components especially the superconductors, a reasonable shielding blanket is needed between tritium breeding blanket (BB) and those superconductors. On account of different BBs, the shielding blanket may have different structures. So far, mainly three conceptual BBs have been designed for CFETR: Helium gas cooled T breeding blanket, water-cooled and LiPb liquid metal coolant blankets. In this paper, based on the water-cooled BB, a conceptual shielding blanket (SB) structure has been proposed. The SB module structural materials are investigated, and the detailed shielding scheme is researched with the simplified 3 D model by using the MCNP program. The cooling structure of the SB module is provided, and the thermomechanical behaviors are analyzed by finite element method. These neutronics and thermomechanical analysis results indicate that the conceptual SB module meets the requirement for shielding and in compliance with thermomechanical standards of structure materials.

Eligible for student paper award?

No

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