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FTP/P7-33: A Feasible DEMO Blanket Concept Based on Water Cooled Solid Breeder

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JAEA has conducted the conceptual design study of blanket for a fusion DEMO reactor SlimCS. Considering DEMO specific requirements, we place emphasis on a blanket concept with durability to severe irradiation, ease of fabrication for mass production, operation temperature of blanket materials, and maintainability using remote handling equipment. This paper present a promising concept satisfying these requirements, which is characterized by minimized welding lines near the front, a simplified blanket interior consisting of cooling tubes and a mixed pebble bed of breeder and neutron multiplier, and approximately the same outlet temperature for all blanket modules. Neutronics calculation indicated that the blanket satisfies a self-sufficient production of tritium. An important finding is that little decrease is seen in tritium breeding ratio even when the gap between neighboring blanket modules is as wide as 0.03 m. This means that blanket modules can be arranged with such a significant clearance gap without sacrifice of tritium production, which will facilitate the access of remote handling equipment for replacement of the blanket modules and improve the access of diagnostics.

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