

Progress of Tritium Plant Technologies for Tokamak Like Fusion Energy in China

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T-plant team for China Fusion Engineering Test Reactor

Abstract

Supported by the national program for fusion energy development in China, the tritium technology team has finished in the concept design of tritium plant for China Fusion Engineering Test Reactor with the fusion power range from 500MW to 1500MW. A set of prototype systems including the inner and outer fuel cycling for 500MW fusion power reactor has been established to test the fast recovery and separation of hydrogen isotopes. More than 99.5% of recovery efficiency was obtained with a net hydrogen isotopes throughput of more than 2.5m³ per hour, which matched well with a continuous burning plasma. Furthermore, such a high recovery rate was tested with grams of real tritium cycling experiment. High detritiation rate for the blanket materials like tungsten and RAFM steel was also obtained. Tritium permeation barrier was developed for long pipes with a high permeation reduction factor of more than 1000 at 773K. Water detritiation including a 50kg/h scale of CECE and 1500 m³/h of wet scrubbing techniques was also developed to get a very high efficiency. Thus the tritium self sufficiency for a Tokamak like fusion reactor was highly feasible from the point of view of its cycling technologies.

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Session Classification: Tritium Fuel Cycle