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水素吸蔵材を用いたダイバータ部での燃料回収のための基礎研究
Basic study for fuel recovery in divertor using hydrogen storage material

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Deuterium and tritium is the fuel particles of unreacted (hydrogen isotope) also flows into the divertor is an exhaust unit with helium ash generated by the fusion reaction. For ensuring the improved performance and safety containment in normal operation, the helium ash and fuel particles is separated, is considered to be recovered selectively fuel particles. Tritium is a radioactive element, since the upper limit of the holding of the vacuum vessel are provided, efficient recovery is desired. The current thinking is to have fuel recovery cycle, it is planned to recover and reuse the only fuel particles by palladium diffuser after exhaust from divertor to vacuum the outside of the container. However, the recovery of hydrogen isotopes is a fuel particles, the accumulation is an issue from the viewpoint of safety to the piping wall.

The purpose of this study was to install a hydrogen storage material in the target which simulates the divertor, to perform recovery experiment of hydrogen isotopes is to propose a particle selective exhaust system using a hydrogen storage material. This time to investigate the effect on the tungsten according to the absorption characteristics and helium deuterium hydrogen isotopes were subjected to irradiation experiment D-He mixture plasma.

In the experiment, the plasma generated was irradiated to a sample was placed in the apparatus terminal end by the linear divertor simulator TPD-Sheet IV (Fig.1). The sample tungsten ITER grade in which the annealed at 1500 ℃ (thickness 1 mm, 10mm×10mm) and, titanium is a hydrogen storage material (with a thickness of 100 μ m, 10 mm×10 mm) piled up, platinum in each of the adhesive surface was used (thickness 0.15 μ m ~ 0.26μm) thing that was deposited. The irradiated plasma is 4 types of deuterium plasma and the D-He mixed plasma (helium 5%, 10%, 15%). Furthermore, changing the irradiation time (15 minutes, 1 hour, 2 hours) in the D-He mixed plasma when helium is 5%. Although fuel particles of a fusion reactor is deuterium and tritium, we were using the deuterium because tritium is difficult to handle. Retention amount of the deuterium were measured using a thermal desorption spectroscopy. And, it shows the retention property at the time of deuterium plasma irradiation and D-He(15%) mixture plasma irradiation (Fig.2). For more information carried out at a poster presentation.

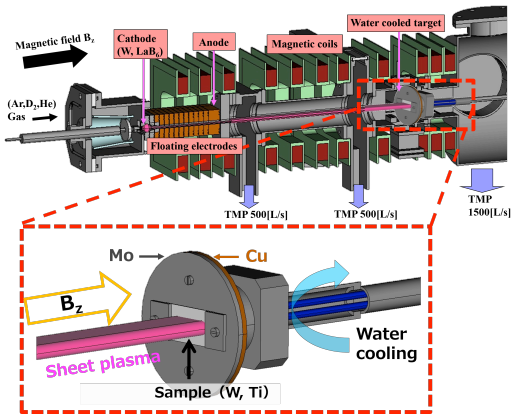

Fig. 1 Linear divertor simulator TPD-Sheet IV

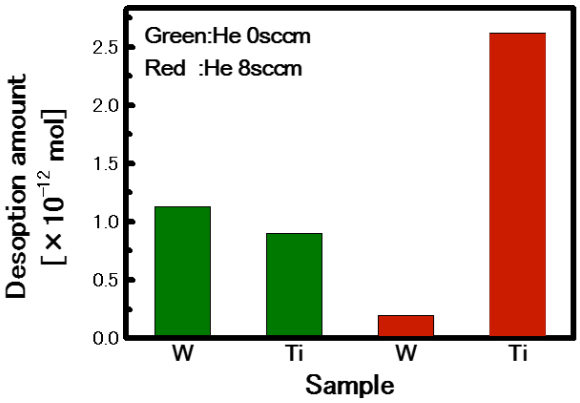

Fig. 2 Retention property of deuterium