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P3.117 Permeation properties of deuterium in tungsten exposed to D-He mixture plasma

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Divertors are responsible for removing the exhaust helium ash generated after fusion in a magnetic fusion reactor. Tungsten (W) was selected as the plasma facing material in the ITER divertor region because of its high melting temperature and thermal conductivity and low sputtering erosion yield. Therefore, it is crucial to understand the behavior of hydrogen isotopes in W contained in the diverter wall material. Effects of He under the D–He mixture plasma on the retention and permeation properties in W of the divertor wall material are investigated. Experiments have been carried out in a linear plasma simulator TPD-Sheet IV. D and He mixture plasma is used, He gas is added at 10 sccm, and ITER-grade W is used as the sample. The permeation property of D in W is investigated using a Ti plate as the D storage material, which is mounted behind W. The retention amount of D in samples is determined by the signals of the thermal desorption spectroscopy (TDS), respectively. The ion density in the D-He mixture plasma measure by the omegatron mass analyzer. The retention and permeation properties in tungsten investigate as a function of the incident flux. The plasma incident fluence is 4.4× 10^20 m^2 for all the plasma incident fluxes. As the plasma incident flux increases, the retention amount of D in W decreases in the D–He mixture plasma irradiation. On the other hand, the retention amount of D in Ti greatly increases. The effects of the D–He mixture plasma on the deuterium retention properties are different depending on plasma incident flux.

Presenter: HAYASHI, Tatsuya (Tokai University Hiratsuka-shi)

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