§49. Conditionings for Plasma Facing Walls of LHD

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LHD has been operated since Mar., 1998. First experimental campaign and second experimental campaign were carried out for the periods from Mar., 1998 to May, 1998, and from Sept., 1998 to Dec., 1998, respectively. In the first campaign, the plasma facing walls were exposed to totally 1800 shots consisting H_2 or He main discharges with ECH power of 350 kW and ECR discharge cleanings with a power of 5 kW. Titanium flash was also conducted twice per day in every day. In the second campaign, He or H_2 main discharges with NBI heating power of 3 MW, ICRF power of 300 kW and ECH power of 400 kW were carried out. The shot number in the second cycle was totally 5000. Instead of ECR discharge cleanings, He glow discharge cleanings with a power of 6 kW was employed.

During these campaigns, material probes made by 316L SS and graphite samples were placed at the wall of 7-0 port along the poloidal direction. These samples were extracted after the first and second campaigns, and the change of the surface morphology, impurity gas retention, fuel particle retention and impurity depth profile were measured in order to evaluate the effect of the wall conditionings.

Fig.1 shows the locations of the samples placed at the inner wall. Toroidal location was #7 sector. After the first campaign, the deposition of small particles with a size of sub-micron was observed to be dominant, except for the sample at the port. Fig.2 shows that the concentrations of oxygen increased at the position near the plasma, and that of carbon increased at the port, compared with the sample before the exposure. Major species of retained gas observed were H_2O, H_2, CO, CO_2 and CH_4. The desorption of gas was very large at the port, as shown in Fig.3.

After the second campaign, the change of the surface morphology was not clearly observed except for the sample at the position of #1. In addition, the oxygen concentration was observed to be smaller, compared with the case of the first campaign. Retention of fuel gas such as H_2 and He was clearly observed in the position close to the plasma. The total amount of gas retention was approximately 30 % reduced compared with a case of the first campaign.

In the second campaign, the wall was significantly cleaned by both the glow discharge cleanings and the main discharge shot. The results in the present study are roughly consistent with the increase of the plasma stored energy in the second campaign.

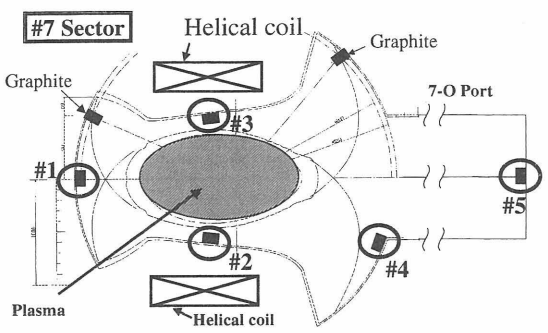

Fig.1 Locations samples placed at the inner wall of toroidal sector #7.

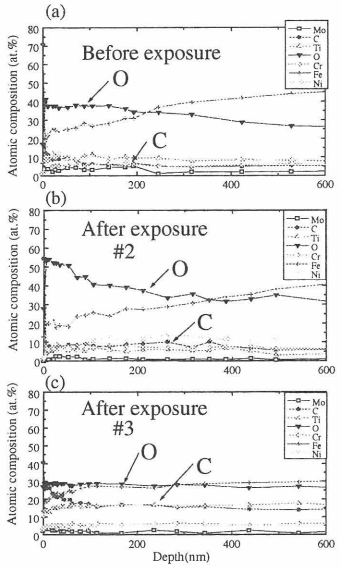

Fig.2 Depth profiles of impurity at the surface for sample before exposure and the samples at #2 and #5.

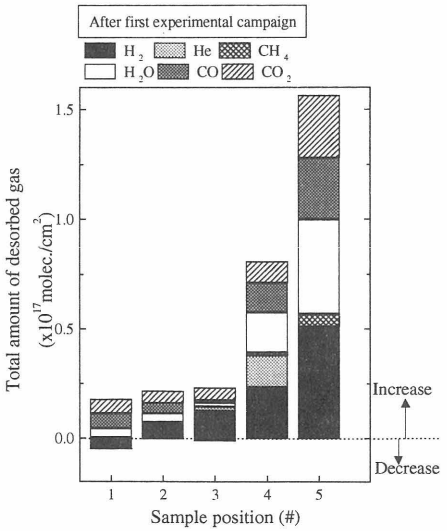

Fig.3 Total amount of retained gas for the samples of #1 - #5.

References

[1] Hino,T. et al, 14 th PSI Conference, Rosenheim, May 22-26, 2000.

[2] Ohuchi, T. et al, J. Vac. Soc. Jpn., **43**(2000)223.