§24. Conditioning Effect on LHD Plasma Facing Wall

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It is important to control hydrogen recyclings and impurity emissions from the wall in discharge operations of LHD. In the operation of first cycle, the wall conditionings were carried out by both helium main discharges and ECR discharge cleanings. After the first stage operation, the material probes of SS placed at several poloidal positions were extracted, and then changes of surface atomic composition and surface morphology, and hydrogen/helium retention were investigated.

Figure 1 shows the positions of SS samples placed at the inner walls. After the first stage operation, the surfaces of #4 and #5 samples were darkened. The oxygen impurity concentrations at the surfaces of #1 and #2 samples increased but these of #3 and #4 samples decreased. In the surfaces of #4 and #5 samples, the carbon concentration increased. In the surface of every sample, the deposition of micro particles with a size of 0.1 μm was observed. In addition, small bubbles were observed.

From the analysis of thermal desorption spectra, it was seen that retained hydrogen amounts of #4 and #5 increased. The desorption amount of H₂O increased in the samples of #1 and #5. Helium retention was also observed in the samples of #1 ~ #4. In particular, the helium retention of #4 was large.

From the analysis for the SS samples, it is conceived that the plasma surface interactions largely took place in the first wall region. In the wall close to the port, the increases of hydrogen/helium retention and impurity concentration were observed.

It is necessary to continue the analysis for the second stage operation in order to clarify the wall conditioning effect.

Reference
1) Ouchi, T., Hino, T., Sagara, A. et al, To be submitted to J. Vac. Soc. of Japan (1999)

Fig. 1  SS samples placed at inner wall of LHD