§71. Impurity Analysis of Carbon Sheet Pump during Plasma Discharge

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It is important for improvement of the plasma performance to reduce hydrogen recycling. First wall of fusion device is exposed to charge-exchange fast neutrals and large amount of hydrogen is desorbed from wall.Carbon Sheet Pump (CSP), which has been developed for reduction of hydrogen recycling in the Large Helical Device (LHD) is designed and investigated [1]. Recently the pumping effect of CSP on actual plasma device is confirmed by using hot-ion plasmas produced in the GAMMA 10 tandem mirror [2]. However, studies on impurity production is another subject to investigate, since high energy particles may cause erosion on the carbon surfaces such as sputtering. Therefore, impurity generation from CSP was estimated by measuring impurity gases in the CSP module during plasma discharge.

Fig.1 shows the schematic view of the CSP module. CSP is shaping in ϕ170mm disk made of C/C sheet of 1.5mm thickness. CSP is installed with radiation shield for baking in a water cooled chamber. Charge-exchange fast neutrals emitted from the GAMMA10 plasma are introduced via extension tube of 400mm in length. We can select the case that CSP is exposed to charge exchange fast neutrals(CSP-on) or not (CSP-off) with shutter opened and closed. Impurity gases during plasma discharge is measured by quadrupole mass spectrometer (QMS) near the test module.

An example of temporal behavior of main partial pressures are represented in Fig.2. The partial pressure of impurity gases was observed to increase just after the end of the plasma discharge. The intensity of the measured impurity pressures was lower than those observed in the main plasma region by about an order of magnitude.

Figure 3 shows the ICRF-power dependence of impurity gases with cases CSP on and off. Partial pressure increases with RF2 Power , but there is not clearly difference between CSP on and off. This result suggests that impurity from CSP during the plasma discharges is very small.

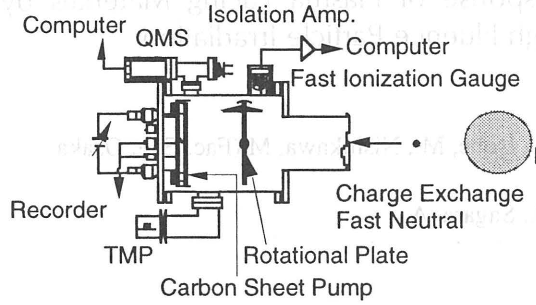

Fig. 1 Schematic view of the test module of CSP and the experimental setup.

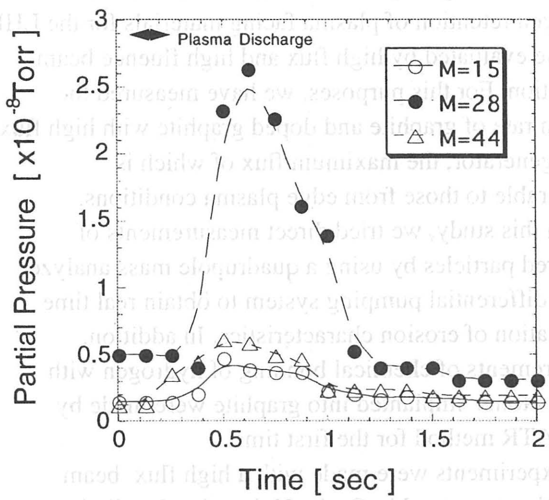

Fig. 2 An example of time evolution of partial pressure of impurity during the plasma discharge.

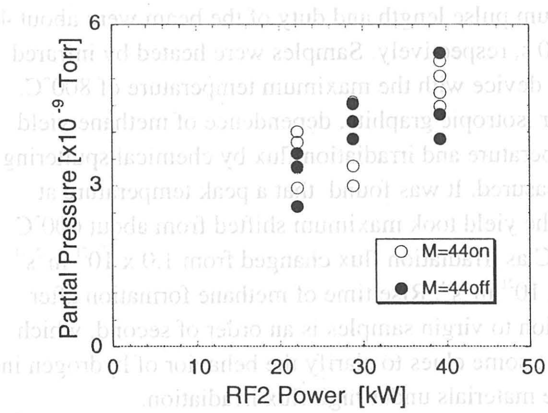

Fig.3 Partial pressure of impurity during the plasma discharge with CSP on and off.

References

1) Sagara, A. et al., J. Nucl. Mater. 220-222 (1995) 627.

2) Tamano, T. et al., Proc. 15th Int. Conf. on Plasma Phys. and Controlled Nucl. Fusion Research, Seville, 1994, Vol. 2 (IAEA, Vienna, 1995) p.399.

3) H.Suzuki et al., Trans. of Fusion Technol. 27 (1995) 523