§16. Influence of Boronization on Impurity Behavior near the Wall

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Nowadays, boronization is regarded as one of the most effective methods of wall conditioning. To study the effect of boronization, we have measured impurity lines near the wall before and after boronizaton, expecting to see the change of recycling. Measurements were carried out by UV-Visible spectroscopy system (DDS) which can observe the edge plasma without viewing the main plasma in JIPP T-IIU. The optical chord was incident on the surface of the carbon divertor plate. Therefore, we can neglect the effect of reflection which must be considered in optical measurements.

Before boronization, oxygen and carbon ions were dominant impurity species, especially C II and O II at edge plasma. High-Z species, except low ionized iron, were not observed. Low charged irons were observed paticularly when plasma hits the wall, i.e. disruption and divertor operation. Spectral lines of boron have been weakly observed even before boronization. It is supposed that boron was released from the electrodes covered with a C/C composit cap contains ~20% boron.

After boronization, it was noticed that spectral intensity of impurity lines have reduced clearly.

On the other hand, strong boron lines were observed. In Fig.1, we show the variation of each spectral line intensity as a function of the shot number. Emission of boron lines ,which drastically increased just after boronization, decreased gradually shot by shot. Decrements are almost proportional to the number of shots. The intensity of other impurity lines were reduced clearly just after boronization; C II 4267 Å decreased to about 1/4 of those before boronization, O II 4351 Å and O V 2781 Å were also reduced to about 1/10. Then intensity of C II and O V lines rised gradually; their increment seemed to be proportional to the number of shots. However,intensity of O II line was kept low even after 150 shots. Furthermore,hydrogen line H_γ have been increased to almost twice and kept constant after boronization.

These phenomena give us important information about the mechanism of impurity suppression by boronization.

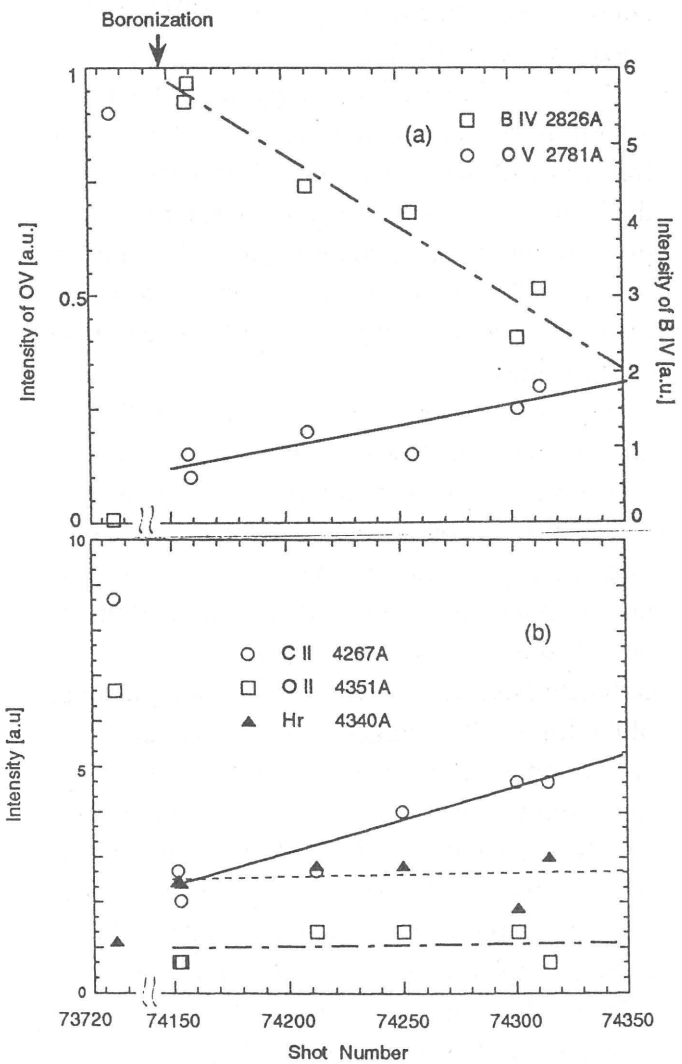

Fig. 1. (a) Intensity variation of lines of highly charged ions near the wall.
(b) Intensitty variation of visible lines near the wall.