

## §14. Compact Boronization System with the Use of Decaborane

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In JIPP T-II U, following the experience of CHS and SUT<sup>1)</sup>, decaborane  $B_{10}H_{14}$  is used for boronization of the first wall. The oven to sublimate decaborane is made of SUS pipe ( $30 \phi \times 70 \text{ mm}$ ). It is connected to the main vacuum vessel through only one gate valve and short 2"  $\phi$  pipe (Fig. 1). This simplicity leads to less chance of misoperation. The oven together with the area near the oven are heated by ribbon heaters controlled by a PID remote control system. The temperature is monitored by thermo couplers attached on the outer surface of the oven. To improve safety for human health, exhaust gas from rotary pumps is monitored with hydrides gas detector (Fig. 2), and power supply for the ribbon heaters are interlocked by the gate of the torus hall.

The procedure of boronization tried on JIPP T-II U is as follows: He glow discharge is carried out where one electrode and one gas puffing valve is used (Fig. 3). The gate valve between the decaborane oven and the main vessel is opened. The

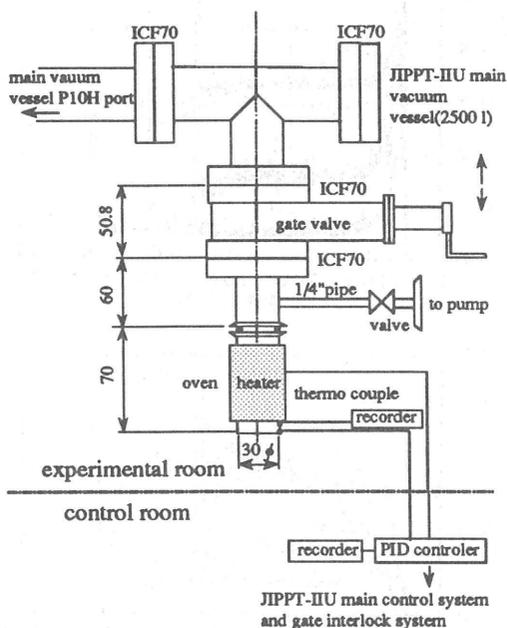


Fig.1 Vacuum system from oven to the main vessel with schematic drawings of control system for boronization.

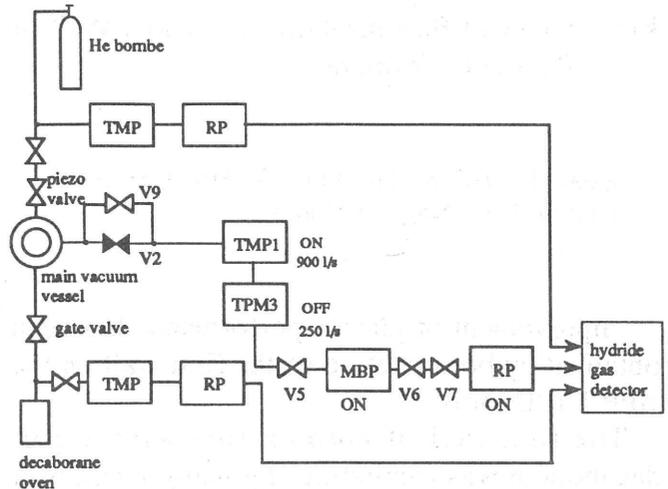


Fig. 2 JIPPT-IIU main pumping system and boronization system. During boronization the main valve V2 is closed and a small conductance valve V9 is opened.

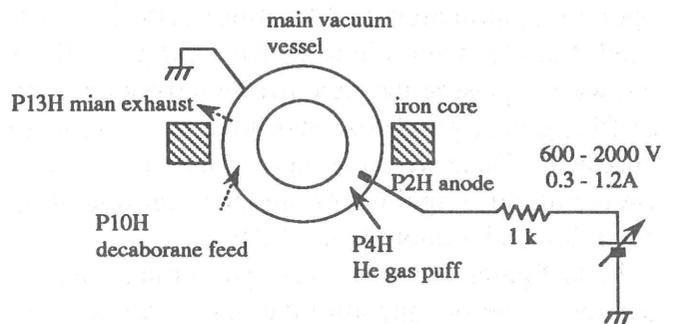


Fig. 3 Schematic diagram of glow discharge. P2H etc. means horizontal port No.2 etc..

oven is heated from room temperature to around  $40^\circ\text{C}$ . The gas pressure in the vessel is controlled so as to gradually reduce from 100 mtorr to 40 mtorr and the oven temperature from  $40^\circ\text{C}$  to  $80^\circ\text{C}$ . The current of glow discharge is set at the relatively high value 0.8 - 1.2 A. The feeding rate of He gas is around 0.5 torr · l/s. The discharge becomes unstable and is easily turned off in the cases where gas feeding rate or discharge current is too small. This boronization process is usually continued for 2-3 hours, and is then followed by 1 hour to several days of He glow discharge cleaning depending on the situation, in order to reduce particle recycling.

### Referece

- 1) Noda, N. et al., Ann. Rep. of NIFS (Apr. 1993-Mar. 1994) p.46.