

## TPD-II Device

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Modifications of TPD-II device (shown in Fig.1) for higher current discharges have been started in this fiscal year. Stationary quiescent plasma with high electron density ( $n_e \geq 10^{15} \text{ cm}^{-3}$ ,  $T_e \geq 10 \text{ eV}$ ) is expected with fairly high current discharges. Objectives of the production of high density plasmas are ;

- 1) Control of the inverted population density in recombining plasmas for the basic research of a short wave length laser.
- 2) Investigations of atomic processes in high density plasmas, which may simulate the plasma in divertor region.

Steady state discharge of 300A is established. The difficulty for high current discharge in steady state is the development of the parts in discharge region. The cathode, the floating electrodes and the anode should be proof against high heat fluxes.

Firstly, the  $\text{LaB}_6$  disk (80φ) was used as a cathode, but which was broken with a crack owing to thermal stress of the temperature gradient and strongly eroded in discharge current of more than 100A.

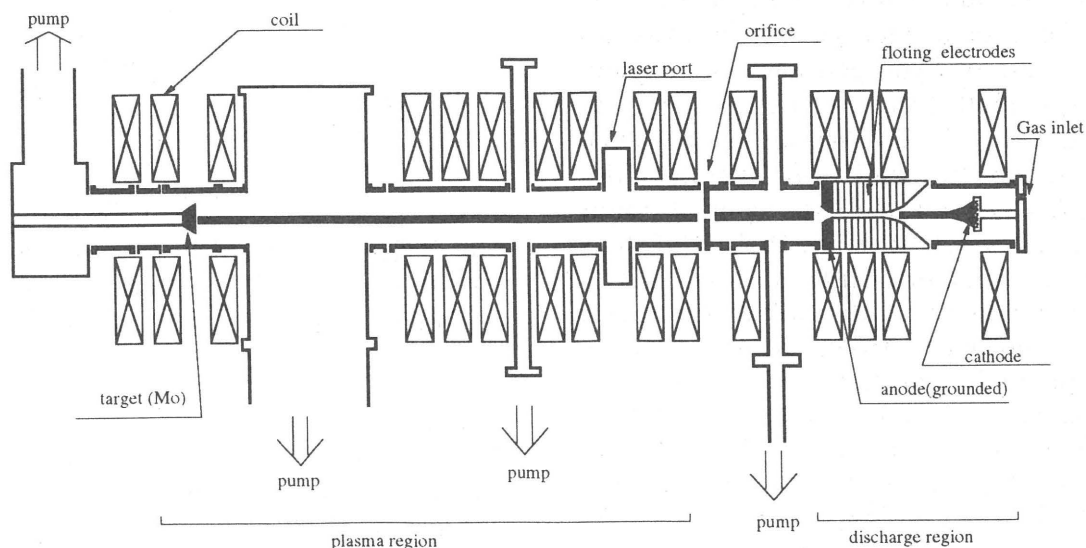


Fig.1 Schematic diagram of TPD-II

which has a characteristic in two hundred Th/W pins was used.

By using this cathode, we could easily start the glow discharge because of the electric field emission, and the cathode is heated by the glow discharge itself; as a result, the discharge mode changes to arc discharge by strong emission of thermal electrons. No damage was observed in this cathode after running of 300A discharge.

Quantitative measurements of  $n_e$  and  $T_e$  will be performed by the YAG Thomson scattering. Already assignment of ArIV spectrum (ionization potential of -59.8 eV) suggests the fairly high electron temperature in TPD-II.

Next year, we will start to investigate the atomic process in a recombining plasma, particularly  $\text{He}^{2+}$  and  $\text{H}_2$  collisions, by spectroscopic methods.

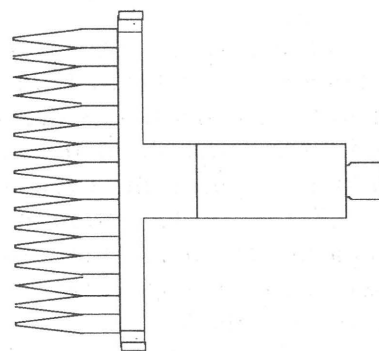


Fig.2 Structure of Th/W cathode