§13. Optimization for Cesium Seeding into a Large RF Hydrogen Negative Ion Source

Takanashi,T., Takeiri,Y., Kaneko,O., Oka,Y., Tsumori,K., Kuroda,T.

Cesium seeding into a large RF negative ion source has resulted in increasing the hydrogen negative ion current. The cesium effect accompanies lowering of the gas pressure, improvement of the power efficiency and reduction of the extracted electron current. This report describes optimization on cesium seeding into the large RF-driven hydrogen negative ion source.

The RF-driven hydrogen negative ion source has been improved in this experiment. In the cesium-mode operation, the thermally isolated plasma grid and the chamber wall that is covered

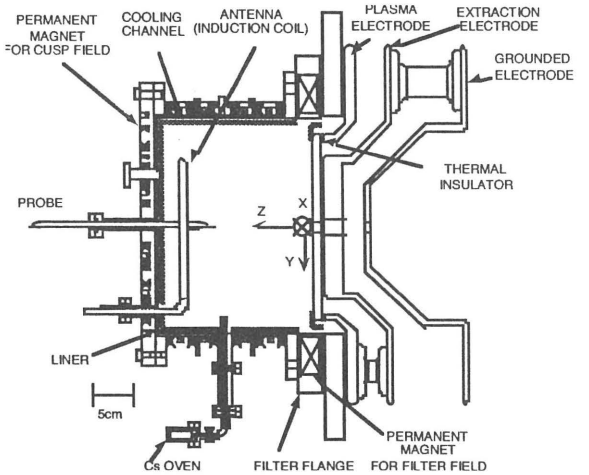

Fig.1 Schematic of the RF-driven hydrogen negative ion source.

with liner are used. The large RF-driven hydrogen negative ion source is shown in fig.1. The liner covers the chamber wall and plasma grid in order to avoid condensation of cesium on their surface. The plasma grid is heated up to 250°C.

The H^- current with and without the cesium seeding is shown in fig.2 as a function of the gas pressure at 14kW of an RF power. In the

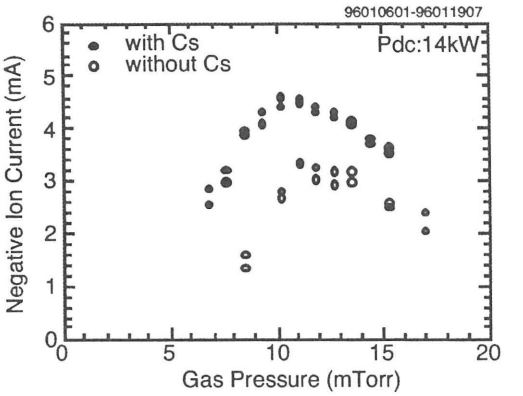

Fig.2 Negative hydrogen ion current as a function of the gas pressure.

case of the cesium seeding the H^- current is greater than that in the case without the cesium seeding. The gas pressure, at which the maximum negative ion current was obtained, was observed to be decreased. Figure 3 shows the H^- current as a function of the RF power. The power efficiency for the negative ion current is improved with the cesium seeding even at the lower gas pressure.

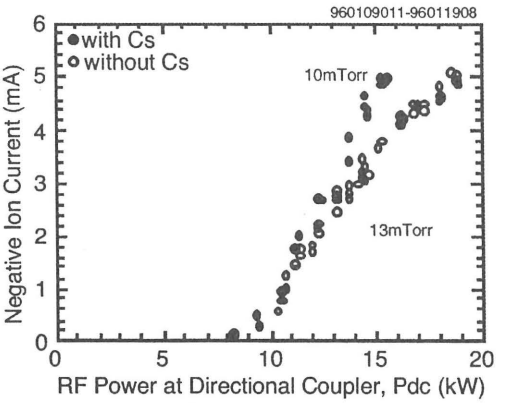

Fig.3 Negative hydrogen ion current as a function of the gas pressure.

From these results, it is found that the cesium seeding improves the H^- current in the RF negative ion source as well as in the filament-arc sources. Iincrement of the H^- current by the Cs seeding was smaller than that in the filament-arc sources. As the experiments were operated with no acceleration voltage, a part of the H^- ions were intercected by the extraction grid.

By improving and optimizing the accelerator, we could improve the H^- currents.