§7. Cesium Seeding into a Large RF Negative Ion Source

Takanashi, T. (The Graduate University for Advanced Studies)
Takeiri Y., Kaneko, O., Oka, Y., Ando, A., Tsumori, K., Kuroda, T.

A much increase of the negative ion current has been observed in the filament-arc type negative ion source with cesium seeding. The cesium effect is accompanied with lowering of the gas pressure, improvement of the power efficiency and reduction of the extracted electron current. It is required to confirm the cesium effect in the RF negative ion source.

In the cesium-mode operation, the thermally isolated plasma grid made of molybdenum is used. The temperature of the plasma grid is controllable up to 300°C with the attached sheath heater. A cesium oven is installed to the plasma chamber wall, and cesium is supplied into the plasma chamber during the operation.

Figure 1 shows the H\(^{-}\) currents with and without the cesium seeding as a function of the gas pressure, at 20kW of the RF power. About 4mA of the negative ion current is obtained without the cesium at around 15mTorr of the gas pressure, while about 5mA is obtained with the cesium seeding at around 11mTorr. As shown in Fig.1, it is observed that the optimum gas pressure is reduced by the cesium seeding.

The H\(^{-}\) currents with and without the cesium seeding are shown in Fig.2, 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.

From these results, it is found that the cesium effect is confirmed also in the RF negative ion source. No problem occurred during the operation with the cesium seeding. However, much increase of the negative ion current was not observed. By optimizing the cesium mode operation in the RF source, more increase of the negative ion current will be observed.

Fig. 1. Negative Hydrogen ion current as a function of the gas pressure.

Fig. 2. Negative Hydrogen ion current as a function of the RF Power.

References