ThuPS04

Effect of Axial Magnetic Field on a 2.45 GHz Permanent Magnet ECR Ion Source

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We have built a new 2.45 GHz permanent magnet electron cyclotron resonance ion source at Oshima College (Oshima-ECRIS) [1]. Our target is middle-charged ion beam production for industrial applications, i.e. ion implantation for semiconductors. Therefore, we selected an ECRIS with a 2.45 GHz microwave source and permanent magnets as a low-cost and low-power consumption ion source. However, 2.45 GHz ECRISs generally have low ionization efficiency compared with higher frequency ones. We need to develop the technique to improve the efficiency.

As a first step, we have investigated the optimization of the axial magnetic field. Though magnetic fields on ECRISs is the most important factor, normal permanent magnet ECRIS cannot vary the magnetic field. Since the Oshima-ECRIS has three electric coils for adjusting axial magnetic field, we can adjust the mirror magnetic field, i.e. the strength of injection and extraction side magnetic fields and mirror ratio. We study the variation of ion beams against the axial mirror field configuration. As a result of experiment, the tendency that the production of the multivalent ion changed by adjusting a magnetic field of the beam outlet side was seen.

We will describe the detailed results at the conference.

References

[1] T. Asaji, et al., Rev. Sci. Instrum. 85, 02A940 (2014).