Contribution ID: **8** Type: **Oral**

Study of plasma meniscus including the surface produced negative ions by using PIC-MCC simulation

Friday, 7 October 2022 09:00 (30 minutes)

It is essential to generate the negative ion beams with good beam optics for the negative ion sources. Negative ion beam optics is determined by the shape of the plasma meniscus, which is an ion emitting surface. However, for the electronegative plasma including the surface produced H- ions in the negative ion sources, the key parameters to control the plasma meniscus and the dependence on these parameters are unclear.
In this study, the plasma meniscus and relevant physical structure such as the sheath in the electronegative plasma including the surface produced H- ions is investigated by using PIC-MCC simulation. The region from the source plasma up to the accelerator is modeled for a single aperture, and thus, the plasma meniscus can be solved self-consistently. Electrons, H+ ions, volume produced H- ions are assumed to be launched as Maxwellian distributions with the temperatures of 0.8 eV, 0.3 eV, 0.1 eV, respectively. After the plasma contained the electrons, the H+ ions, and the volume produced H- ions reaches the steady state, the surface produced H- ions are launched uniformly from the PG surface. The surface produced H- ions are assumed to be the half-Maxwellian distribution with the temperature of 1 eV.
It is shown that the distance deff, between the plasma meniscus and the extraction grid depends on the ratio of the negative ion density to the electron density as well as the plasma density. Especially, the distance deff, decrease with the increase of the ratio under the constant plasma density, which means that the shape of the plasma meniscus becomes flat or convex rather than concave. This is due to the larger space charge effect of the H- ions than that of electrons. The electric field produced by the space charge of the H- ions prevents penetration of the electric field for H- extraction into the source plasma.

Primary author: MIYAMOTO, Kenji

Co-authors: Prof. HATAYAMA, Akiyoshi (Keio University); Mr HAYASHI, Katsuya (Keio University); Dr HOSHINO, Kazuo (Keio University)

Presenter: MIYAMOTO, Kenji

Session Classification: Oral session 11

Track Classification: 12. Numerical simulations of sources or beams