Contribution ID: **48** Type: **Oral**

Plasma Electrode Materials for Cs-free Negative hydrogen ion Sources

Wednesday 5 October 2022 14:40 (30 minutes)

Cesium additives are currently used in negative hydrogen(H-/D-) ion sources, which are key components in nuclear fusion plasma heating systems and high energy proton accelerators. Here, a thin cesium layer on a Molybdenum plasma electrode (or plasma grid), PE, lowers the surface work function, and results in high H-/D- production rates. However, in future systems, alternative ion source schemes and/or alternative new PE materials realizing high negative ion yields are demanded from the maintenance aspect, and for the stable operation. In this paper, we focus the discussion on some new PE materials from viewpoints of production mechanism and ion source applications.

Generally, negative hydrogen(H-/D-) ion sources are operated at the positive PE bias, for higher extracted H- current and reduction of the co-extracted electron current. The plasma potential profiles are affected by the positive PE bias, and hence, H- transport towards the extraction is enhanced. We will discuss the bias effect in an ion source with a C12A7 electride PE.

When the PE is positively biased, the production surface is mostly bombarded by energetic neutrals, but the basic H-/D- production processes can be simulated by ion injection. An ion energy analysis mass spectrometry is used to detect the negative ions produced on the surface negatively biased in a H2 or D2 plasma. The photoemission yield spectroscopy is used as well to measure the surface work function. Some results obtained with alternative materials such as diamond-like carbon or C12A7 electrides will be shown.

Author: SASAO, Mamiko (Office of R&D Promotion, Doshisha University)

Co-authors: WADA, Motoi (Doshisha University); CARTRY, Gilles (Aix Marseille University)

Presenter: SASAO, Mamiko (Office of R&D Promotion, Doshisha University)

Session Classification: Oral session 9

Track Classification: 1. Fundamental processes and modelling