

Factors affecting VUV emission spectrum near Lyman- α from a hydrogen plasma source

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Two steps constitute the electron volume process to produce hydrogen negative ions (H^-). At first, high energy electrons produce vibrationally excited hydrogen molecules in discharge. Then low energy electrons are attached to these vibrationally excited molecules to dissociate them into atomic hydrogen and H^- . Observation of vacuum ultra violet (VUV) emission spectrum give information on the density and the distribution of vibrational excitation levels of hydrogen molecules in the plasma. Thus, a correlation between the VUV emission spectrum and the extractable negative ion current has been investigated from early studies of electron volume process leading to H^- formation [1]. In this work, the effect due to the condition of the ion source surface upon the VUV emission spectrum is investigated.

The ion source used for this experiment is made of stainless steel, and has a cylindrical shape with 160 mm inside diameter and 200 mm length. A magnetic multi-cusp field geometry has been realized by attaching 16 rows of Sm-Co magnets on the cylindrical ion source wall. A pair of W filament cathodes are installed on vacuum tight motion feed throughs, and the position of the filaments from the ion source axis can be adjusted. A frequency power spectrum obtained from the floating potential measured by a Langmuir probe has shown that the produced plasma is quiet so long as the discharge filament are located inside of the magnetic field free region. Coatings on surfaces are made by evaporating metallic elements mounted at one of the filament port. During the ion source operation the coated surface may be saturated with particle fluxes from hydrogen plasma, and can gradually change the VUV emission spectrum. Effects by other surface-plasma parameters like surface temperature and homogeneity of the plasma grid will be measured and discussed.

[1] W. G. Graham, J. Phys. D. **17**, 2225 (1984).

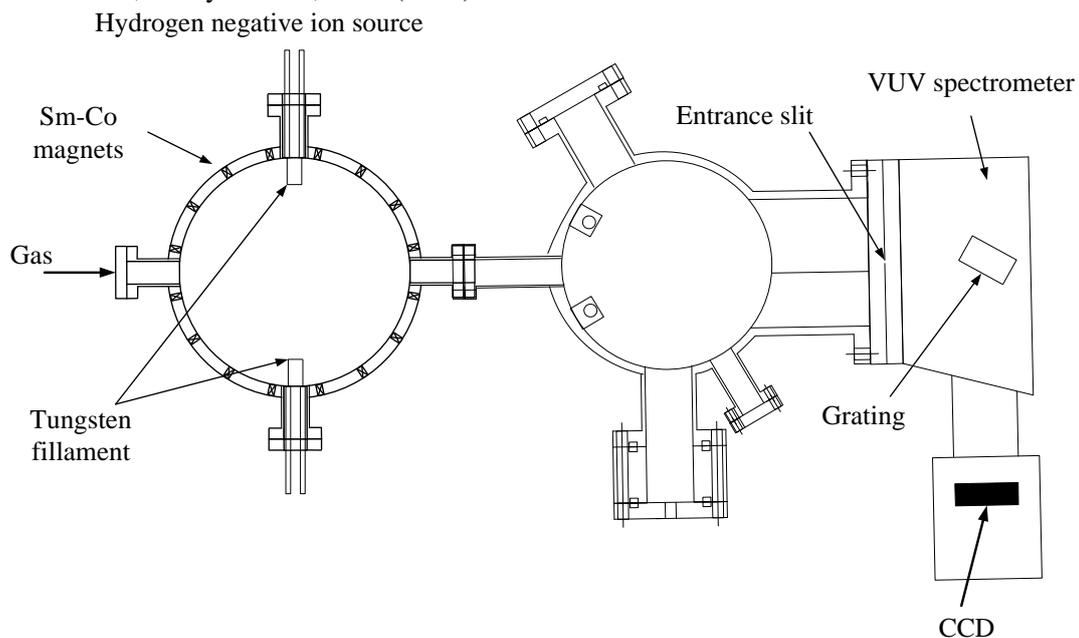


Fig.1 Schematic diagram of experimental apparatus.