Seminar

Institute for Plasma Research

Title : Role of Effective Secondary Electron Emission Coefficient in Glow Discharge Plasmas

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Time : 03.30 PM

Venue : Committee Room 3, (New Building), IPR

Abstract :

Secondary electrons (SEs) emitted from material surface in laboratory plasma have control over almost all the plasma parameters such as plasma density, electron/ion temperatures, power influx to the material etc. The ratio of emitted electron flux to the incident ion flux on a material surface is called ion induced secondary electron emission coefficient (ISEEC, Υi). However, under glow discharge plasma condition, there are various species that can eject SEs from material surface such as electrons, energetic neutrals, exited species, photons etc in addition to ion. The non-ionic cathode directed species (photons, metastables and energetic neutrals, electrons) that results from ion actively participate in the process of secondary electron emission (SEE) from cathode in DC discharges. Adding the contribution of non-ionic species (fast atoms, photons, meta-stable atoms, molecules, etc.) to Υi gives the effective number of SEs ejected from the cathode per incident ion, which is higher than Υi and this is referred as effective secondary electron emission coefficient (ESEEC, ΥE). In the present work, we proposed a self consistent model for measurement of ΥE value of cathode material under abnormal glow discharge plasma condition. Using this model, we measured the ΥE value of different cathode (Tungsten (W), Copper (Cu)) material using different operating gases (Nitrogen (N2) and Argon (Ar)) for different pressures (0.15 mbar to 0.45 mbar). In addition to discharge conditions, the results show that possible dependence of ΥE value on the material properties such as work function and Fermi energy of cathode.

References:

[1] Saravanan A, Prince Alex and Suraj K S Phy. Plasmas 24, 112106(2017).
[2] Saravanan A, Prince Alex and Suraj K S Curr. Smart. Mat 2, 44(2017).
[3] M A Lieberman and A. J. Lichtenberg, Principle of Plasma Discharges and Material Processing (Wiley, New York, 1994).