# Seminar

# Institute for Plasma Research

**Title :** Experimental Study of Near Anode Plasma in Hollow Cathode Cross Field Discharges

**Speaker:** Mr. Ramkrishna Rane
Institute for Plasma Research, Gandhinagar

**Date :** 12th November 2018 (Monday)

**Time :** 03.30 PM

**Venue :** Seminar Hall, IPR

**Abstract :**

DC discharges in hollow cathode configuration are used in a wide variety of applications such as efficient light sources, ion sources, nitriding , basic plasma research and coating processes. In this study, we present the experimental results of the effect of magnetic field on the plasma properties near the anode of two types of sources i.e. hollow cathode cylindrical magnetron (HCCM) and modified hollow cathode. In a HCCM, the transition from positive space charge to negative space charge due to magnetic field has been demonstrated. In the HCCM configuration, discharge is not sustained in positive space charge mode at a critical magnetic field. It is observed that, the anode fall becomes prominent in presence of magnetic field. In addition, the plasma potential profile near the anode shows two distinct regions with potential difference of 10-15 V at the boundary of anode glow. The size of the anode glow increases with magnetic field in order to collect more electron current. The stable electron sheath near the anode transforms into oscillating anode glow with the application of magnetic field beyond 4-5 Gauss. The oscillation frequency increases linearly with discharge power and argon pressure while it decreases with magnetic field.

In the modified hollow cathode discharge, an onset of anode glow at a critical applied magnetic field indicates formation of electron sheath and anode spots. The discharge current initially decreases; however it starts to rise again as the anode spot appears on the anode. The plasma potential locks to the ionization potential of argon gas when anode spot is completely formed. During the transition from ion to electron sheath, the electron temperature increases while plasma density decreases in the bulk plasma. The intensity of the spectral lines also showed a dip during the transition between two sheaths. After the formation of the anode spot, oscillations of the order of 5-20 kHz are observed in the discharge current and floating potential due to the enhanced ionization and excitation processes in the electron sheath.