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Effect of Hydrogen Ratio on Plasma Parameters of N2–H2 Gas Mixture Glow Discharge

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Abstract—A dc plane glow discharge in a nitrogen-hydrogen (N_2–H_2) gas mixture has been operated at discharge currents of 10 and 20 mA. The electron energy distribution function (EEDF) at different hydrogen concentrations is measured. A Maxwellian EEDF is found in the positive column region, while in both cathode fall and negative glow regions, a non-Maxwellian one is observed. Langmuir electric probes are used at different axial positions, gas pressures, and hydrogen concentrations to measure the electron temperature and plasma density. The electron temperature is found to increase with increasing H_2 concentration and decrease with increasing both the axial distance from the cathode and the mixture pressure. At first, with increasing distance from the cathode, the ion density decreases, while the electron density increases; then, as the anode is further approached, they remain nearly constant. At different H_2 concentrations, the electron and ion densities decrease with increasing the mixture pressure. Both the electron and ion densities slightly decrease with increasing H_2 concentration.

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