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Evolution of Multiple Double Layer in Glow discharge and its inherent Properties PRINCE ALEX, SARAVANAN A, SURAJ SINHA, Pondicherry University — Formation and evolution of multiple anodic double layers (MADLs) were experimentally studied in glow discharge plasma. The boundary condition for the existence of MADL was identified in terms of threshold bias and ambient working pressure. The MADL formation is accompanied by an explosive growth in anode current and consequent current-voltage characteristics follows a hysteresis loop. The analysis yield that stable MADLs is only observed when the control voltage V_2 is between a certain critical values ($V_q < V_2 < V_r$ and $V_t < V_2 < V_u$). At V_q , electron drift velocity exceed the electron thermal velocity (ν_d ~$4\nu_{te}$) results in Buneman instability and leads the formation of MADL. Above V_r MADL begins to decay and at large V_2 where $\nu_d >> \nu_{te}$ MADL completely transforms to an intense high current carrying unstable anode glow. The floating potential analysis carried out using three axially positioned electrostatic probes shows a bipolar signature of DL with as the control parameter is varied. The floating potential analysis also shows that hysteresis arises due to the difference in magnitude of electric field required to align the space charges in the DL sheet at the control voltage changes forward and backward. The effect of pressure on MADL indicates that the MADL structure advances towards anode surface as the pressure is increases. The power dumped (W) in the MADL is estimated to decrease with increase in pressure while the same increase in the anode glow.

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