Time Evolution of Hollow Cathode Ionization Processes in the Final Breakdown Phase of a Transient Hollow Cathode Discharge

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Abstract

The enhanced ionization processes taking place inside the hollow cathode region (HCR) of a transient hollow cathode discharge (THCD) are essential events which lead to final electrical breakdown. This ionization growth is permanently assisted by a virtual anode moving in the anode–cathode gap (A–K gap), which extends the anode potential to within the hollow cathode region. In this paper, the ionization growth inside the HCR under enhanced field due to the close proximity of the anode potential has been studied using a statistical technique in a range of pressures, with three different cathode apertures. Statistical time distributions of an extensive experimental data set are analyzed to understand the mechanisms involved in the final stages, just before electric breakdown.

Key words: Gas discharges, hollow cathode, ionization growth.