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Current-Voltage Measurements for DC Microplasmas with Gap Sizes Less Than 10 μm PAUL RUMBACH, DAVID GO, University of Notre Dame — Direct current (DC) microplasmas have been of great interest to the scientific community for the past decade because of their non-equilibrium characteristics and stability at atmospheric pressures. Owing to their large surface-to-volume ratio, processes occurring at the cathode surface can play a dominant role in determining many of the thermodynamic properties of a DC microplasma. Better understanding of these processes can lead to better control of thermodynamic properties, such as the electron energy distribution function. The departure from typical Paschen pressure$\times$distance pd-scaling for breakdown in gap sizes d $< 5\mu$m indicates that processes other than traditional secondary emission are producing electron current at the cathode, and ion-enhanced field emission has been identified as the main process leading to the so-called modified Paschen's curve. However, it is still unclear what other properties ion-enhanced field emission affects in addition to breakdown and its ultimate role in sustaining the microplasma. Using a classic, one-dimensional, parallel plate setup, current-voltage (iV) curves are measured for gap sizes less than 10 μm in both pure argon and nitrogen with pressures ranging from 1 to 750 torr. Distinct features of these iV curves provide insight to the different processes occurring in DC microplasmas that separate them from their meso- ($\sim$100 μms) and macroscale counterparts ($>$ 1 mm).

Paul Rumbach
University of Notre Dame

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