Abstract Submitted
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Formation of Anode Spots in Low Pressure Plasmas[1] BRETT SCHEINER, Univ of Iowa, EDWARD BARNAT, MATTHEW HOPKINS, Sandia National Laboratories, SCOTT BAALRUD, Univ of Iowa, BENJAMIN YEE, Sandia National Laboratories — When small electrodes are biased sufficiently above the plasma potential, the rate of electron impact ionization of neutrals can increase near the electrode. At neutral gas pressures of ˜1-100mTorr, it has been previously observed that if this ionization rate is sufficiently high a double layer forms near the electrode. Sometimes this double layer will move outward, separating a high potential plasma, attached to the electrode surface, from the bulk plasma. This phenomenon is known as an anode spot or fireball. Using observations from the first 2D particle-in-cell simulations of the anode spot, a model has been developed describing this formation process. In this model ionization leads to the buildup of an ion rich region adjacent to the electrode, which modifies the potential structure in a way that traps electrons near the electrode surface. This establishes a quasineutral plasma near the electrode. When the density of this plasma is large enough, a pressure imbalance across the double layer leads to its expansion from the electrode surface. Observations from simulations, along with the presented model, are found to be consistent with time resolved measurements of the electron density from laser collision induced fluorescence, and with plasma emission measurements.

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