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Studies of Asperity-Scale Plasma Discharge Phenomena JAVAN ALBRIGHT, University of Texas, LAXMINARAYAN RAJA, MATTHEW MANLEY, K. RAVI-CHANDAR, SIKHANDA SATAPATHY, COMPUTATIONS COLLABORATION, EXPERIMENTS COLLABORATION — A combined experimental and computational simulation study of direct-current plasma discharge phenomena in small length-scale geometries (<10 μm) is described. The primary goal is to study discharge breakdown characteristics in small length scale geometries as quantified by a modified Paschen breakdown curve and the quench characteristics in these discharges. A modified mesoscale friction tester apparatus is used for the experiments. A self-consistent non-equilibrium plasma model is used for the simulation studies. The model includes field emission effects which is a key process in determining small length-scale breakdown behavior. The breakdown curves obtained from the experiment and simulation showed excellent agreement providing a measure of validation for the model. Quantification of the heat fluxes to the electrodes from the simulations shows significantly higher overall heat flux at the cathode surface compared to that at the anode surface, indicating asymmetry in the discharge.

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