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Investigation of Discharge Processes in a High-Pressure Pulsed Arc Discharge Environment for Model Verification. RICKY TANG, ANDREW FIERRO, EDWARD BARNAT, MATTHEW HOPKINS, Sandia National Laboratories — Characteristics of a plasma generated in an arc discharge are investigated. In a discharge, various processes contribute to overall characteristics. Electron chemistry and photonic processes each play a role in establishing the discharge environment based on background pressure and gas species involved. Photonic processes have been incorporated into a PIC-DSMC plasma modeling code, showing effects of including these processes on the discharge current and generating simulated photo-emission spectra. A high-pressure arc discharge experiment was set up to validate model prediction and attempt to elucidate mechanisms of charged species interaction during discharge and in the post-arc environment. Photodetectors and optical emission spectroscopy are used to probe the plasmas and characterize their spectral responses. Discharges generated with inert and reactive gases (nitrogen and air) are studied. Furthermore, differentially-charged species in the post-arc environment interact via local electric field, resulting in current flow. Model can simulate/isolate various processes, and discharge behavior can be inferred by measuring dI/dt and compared with predicted observables, showing FFT components associated with this localized current flow due to charged species interaction.

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