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PIC-DSMC simulation of a triggered vacuum switch with a copper/beryllium cathode[1] ANDREW FIERRO, CHRIS MOORE, STAN MOORE, LAURA BIEDERMANN, MATTHEW HOPKINS, Sandia National Laboratories
— Typical vacuum discharge simulations rely on the injection of neutral or ionized metal vapor from the cathode into an electrically stressed anode-cathode gap. Simultaneous electron emission, also from the cathode, allows for electron-impact ionization of the emitted metal vapor allowing for plasma formation and subsequent closing mechanism to begin. This work looks to analyze the effect of photoemission from the cathode and/or photoionization of metal vapor on the switch closing process through kinetic simulation techniques. A 500 micron anode-cathode gap is chosen with a variable voltage applied to the anode and a grounded half copper, half beryllium cathode. Injection of the metal vapor for both cathode materials is modeled as a linearly ramped flux with a temperature of 1500 K and a bulk velocity (13.2 km/s for Cu and 22 km/s for Be) away from the cathode. Electron-impact excitation of the emitted metal vapor allows for subsequent spontaneous emission of photons which can then photoionize the metal vapor or cause photoemission from the cathode.

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