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Modeling cathode boundary layer discharges E. MUNOZ-SERRANO, Univ Cordoba, J.P. BOEUF, L.C. PITCHFORD, CNRS and Univ Toulouse — A Cathode Boundary Layer Discharge or CBL (Schoenbach, et al Plasma Sources Sci. Technol. 13, 177,2004) is an electrode/dielectric/electrode sandwich with a central hole pierced through the dielectric and one of the electrodes (the anode). Thus, the cathode surface area available to the discharge is limited by the annular dielectric, and the discharge operates in an abnormal glow mode with a positive V-I characteristic at higher current. Using a two-dimensional fluid model, we have studied the electrical properties of CBLs in argon at 100 and 400 torr pressure. The spatial profiles of charged particle and metastable densities, potential, and gas temperature, as well as calculated V-I characteristics will be shown for a range of conditions for a 800 micron hole diameter. One interesting result (anticipated in the work of Belostotskiy, et al, Plasma Sources Sci. Technol 17, 045018, 2008) is that there is a sharp increase in the slope of the V-I characteristic when gas heating is taken into account. This current limiting effect is not observed when the discharge is able to expand on the outer surface of the cathode as in the case of the MicroHollow Cathode Discharge (MHCD) configuration, for example.

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