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A Zero Dimensional Model of High-Pressure Ablative Capillary Discharge LEONID PEKKER, OKSANA PEKKER, ERC — The presented model of high-pressure ablative capillary discharge includes: a heat-transfer radiation model based on radiation database constructed using PrismSPECT, a commercially available radiation software, to calculate the radiation heat flux output from a uniform plasma slab; a model of the transition boundary layer between the uniform plasma core and the ablative wall to calculate the thermal and radiation heat fluxes at the capillary wall; capillary wall thermal conduction and radiation absorption; and a RLC circuit. Thus, the model self-consistently calculates plasma parameters of the capillary discharge and distribution of wall temperature vs. time. We show that the radiation grey factor varies from 0.06 to 0.95 with time. This illustrates that the grey factor can change significantly with time in nonsteady operation regime and, therefore, assuming that it is constant can lead to false results. The model also shows that small extinction coefficients of the wall material lead to large energy losses from the capillary discharges (the heat is absorbed by the bulk of the capillary wall or just escapes the capillary) and to spikes in plasma temperature. If the extinction coefficient is too small, the discharge may become extinguished because the temperature of ablative surface does not increase fast enough to compensate the plasma exhaust from the open end of the capillary.

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