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Different modes of arc attachment at HID cathodes: Simulation and comparison to measurements OLIVER LANGENSCHEIDT, LARS DABRINGHAUSEN, STEFAN LICHTENBERG, JUERGEN MENTEL, PETER AWAKOWICZ, Ruhr-University of Bochum — Based on a model for the plasma boundary layer of high intensity discharge (HID) cathodes simulations are performed and compared to experimental results. To solve the power balance of the cathode body 1D, 2D and 3D finite-element calculations are used. The simulations are done for cylindrical tungsten cathodes operated in different pure noble gas discharges (0.1 . . . 1.0MPa) and with currents between 0.5A to 10A. Under these conditions different modes of arc attachment are found both in simulations and experiments. For the diffuse mode of arc attachment an excellent quantitative agreement between measurements and the simulations is obtained reflecting an improved accuracy of measurements and of simulation. In addition different spot modes are found. At least one of these modes is also observed in the experiment. Also for this spot mode the agreement between measurements and simulation for the integral quantities is good but there are still some open questions concerning the spot mode of cathodic arc attachment. Evaluating the cathode fall characteristics regions of existence for the different modes are found, which are similar to the experiments.

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