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Advanced simulation of arc discharges and their electrodes[1]
MIKHAIL BENILOV, Universidade da Madeira — Plasmas in the bulk of many arc discharges are close to local thermodynamic equilibrium (LTE) and most authors have described arc discharges by means of one-fluid MHD models. While being useful, such models lose their validity in near-electrodes regions, where LTE breaks down. Since appropriate arrangement of current transfer to electrodes is of critical importance, significant efforts have been invested by many workers in order to go beyond LTE MGD models and important advances have been achieved in the course of the last decade. In particular, fully non-equilibrium models have been developed for model 1D problems and 2D low-current arcs. Methods have been developed that employ models of different levels of complexity (assuming quasi-neutrality, or quasi-neutrality and ionization equilibrium, or full LTE) with appropriate boundary conditions at the plasma-electrode interfaces (describing, respectively, the space-charge sheath, or the sheath and the ionization layer, or the sheath, the ionization layer, and the layer of thermal non-equilibrium). Methods of simulation of spots and spot patterns on electrodes have been developed, as well as first-principle models of erosion of cathodes of vacuum and low-pressure arcs. These and other advances are discussed in this talk.

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