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Study of the Anodic Region of Electric Arcs by a Two-Temperature Model MARGARITA BAEVA, SERGEY GORCHAKOV, DIRK UHRLANDT, INP Greifswald, Felix-Hausdorff-Str. 2, D-17489 Greifswald, Germany — Electric arcs are widely used in such industrial applications as welding, cutting and waste treatment. In order to optimize the device parameters and operation conditions, amongst others understanding of the discharge physics in the boundary regions near the electrodes is necessary. The discharge properties in these regions are influenced by evaporating material and the plasma shows strong deviations from the local thermodynamic equilibrium. For the study of the arc-anode interaction a two-temperature, multi-component model for the anodic region has been developed and applied. The non-equilibrium mixture composition, corresponding transport coefficients and thermodynamic functions of the mixtures of gas and metal vapor were determined for the parameter range of interest. The energy balance of the anode has been derived by taking into account heat fluxes from the plasma, evaporation, as well as Ohmic heating of the anode. The properties of the non-equilibrium sheath near the anode are evaluated. Results for an argon arc in the presence of copper or iron vapor are presented and discussed.

Sergey Gorchakov
INP Greifswald, Felix-Hausdorff-Str. 2, D-17489 Greifswald, Germany

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