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Non-equilibrium simulation of the spatial and temporal behaviour of a magnetically rotating arc in argon MARGARITA BAEVA, DIRK UHRLANDT, DETLEF LOFFHAGEN, INP Greifswald e.V., Germany — A three-dimensional magnetohydrodynamic model of a DC plasma torch with a rod-type cathode at atmospheric pressure in argon has been developed. The model takes into account a non-equilibrium description of the plasma in the whole computational region. Since the electron temperature remains significantly higher than the heavy particle temperature near the electrodes, the electric conductivity is high enough to ensure current conservation in front of the electrodes. The arc attachment at the anode results from the interplay between the gas dynamic drag force and the Lorentz force. In the presence of an external axial magnetic field, the hot plasma region constrains in the axial and expands in the radial direction. The arc is driven in rotation by the external magnetic field. At moderate magnetic field strength the magnetically driven plasma rotation is resolved and deviations from the axial symmetry have been observed. Results for different plasma and flow parameters are presented and discussed.

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