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2D Electromagnetic and hydrodynamic models of a microwave plasma torch R. ALVAREZ, CFP, IST, Lisboa, L. MARQUES, DF, UM, Braga, L.L. ALVES, CFP, IST, Lisboa — This work reports simulation results for a microwave (2.45 GHz) plasma reactor, operated by an axial injection torch (TIA). The study is based on a two-dimensional electromagnetic (EM) and hydrodynamic description of the TIA-reactor system. The EM model [1] solves Maxwell's equations, yielding the distribution of the EM fields and the averaged power absorbed, for a given spatial profile of the plasma density (with maximum values in the range $10^{14}-10^{15}$ cm^{-3}, according to experimental measurements). Perfect-conductor boundary conditions are satisfied at the reactor walls, and absorbing boundary conditions are used at the open-end of the coaxial waveguide powering the system. The hydrodynamic model solves the Navier-Stokes equations for the flowing neutral gas, yielding the distribution of mass density, pressure and velocities. The input surface (about 1% of the output surface) has a radius of 0,5mm. The boundary conditions impose the input gas flow (∼1000 sccm), the output gas pressure (atmospheric pressure) and no-slip conditions at reactor walls. Simulations are used to provide general guidelines for device optimisation.
[1] R. Álvarez, L.L. Alves, J. Appl. Phys. 101, 103303 (2007)

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