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Numerical modeling of a fast-axial-flow CO2 laser with considering viscosity and ambipolar diffusion

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Abstract

A numerical method for analysis of a fast axial flow glow discharge carbon dioxide laser is developed. The method is based on the self-consistent solution to the two-dimensional steady-state Navier-Stokes equations in thin-shear-layer approximation (slender channel equations), the parabolized glow discharge equations, and the vibrational relaxation equations. The discharge equations include the continuity equations for the electrons, the positive and negative ions. The one-mode relaxation model for the vibrational kinetics and the plane-parallel optical resonator model are used. The present model is based on the assumption of the charge neutrality and limited by consideration of the positive column of discharge without taking into account the cathode-fall and anode-fall regions.