

Abstract Submitted
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Effect of rare gas and product concentration on the electron kinetics of He/CH₄/CO₂ mixtures for Syngas production¹ VASCO GUERRA, Instituto de Plasmas e Fusao Nuclear, Instituto Superior Tecnico, Universidade Tecnica de Lisboa, Portugal, ANDRÉ JANECO, NUNO PINHÃO, Instituto Tecnológico e Nuclear, Instituto Superior Tecnico, Universidade Tecnica de Lisboa, Portugal — In this work we study the electron kinetics in He/CH₄/CO₂ mixtures with the objective of studying Syngas production in cold or warm plasmas. The electron Boltzmann equation is solved in a hydrodynamic regime in a density gradients expansion, using a discrete ordinates numerical method. The electron collision cross sections used are based on sets published by different authors, mostly tested on two-term angular expansion solvers. However the cross sections were modified to ensure coherence between the transport parameters obtained with our Boltzmann solver and the experimental transport parameters. Warm plasma conditions are studied including both super-elastic collisions and multi-step electronic excitation and ionization from vibrational excited levels, mechanisms usually neglected in electron kinetic studies in CH₄ and CO₂. The influence of the rare gas concentration, vibrational temperature and product (CO and H₂) concentrations on the electron velocity distribution function, transport parameters, collision frequencies and fractional power losses is discussed. These results allow the identification of the main energy transfer channels and are a necessary step for the develop a full kinetic model.

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