Abstract Submitted
for the GEC11 Meeting of
The American Physical Society

Collisional – radiative model of helium microwave discharges at atmospheric pressure[1] M. SANTOS, L.L. ALVES, IPFN/IST-UTL, Portugal, K. GADONNA, LPGP-UPS/CNRS, France, T. BELMONTE, LSGS/CNRS, France —

This paper presents a stationary collisional-radiative model to describe the behavior of helium microwave discharges (2.45 GHz), produced in cylindrical geometry (1 mm radius) at atmospheric pressure. The model couples the rate balance equations for the charged particles (electrons, He^+ and He_2^+ ions), the He($n \leq 6$) excited states and the He_2^* excimers, to the two-term homogeneous and stationary electron Boltzmann equation [1,2]. The latter is solved using a coherent set of electron cross sections [2], adjusted to ensure good predictions of the swarm parameters and the Townsend ionization coefficient. The model was solved for typical 5x10^{14} cm^{-3} electron density and 2500 K gas temperature, yielding $[He_2^+]/[He^+] \sim 0.92$ and $[He_2^*]/[He] \sim 3.4\text{x}10^{-8}$. Results show also that the He_2^+ ions are produced mainly from the 3-body conversion of He^+ ions and lost by the corresponding reverse reaction together with diffusion and dissociative recombination. The He_2^* is produced by a 3-body reaction involving the 2^3P states and by the electron-stabilized recombination of He_2^+ and is lost by electron dissociation. [1] L.L. Alves et al, J. Phys. D 25, 1713 (1992). [2] T. Belmonte et al, J. Phys. D 40, 7343 (2007).

[1]Work supported by FCT-MCTES under PTDC/FIS/65924/2006

L.L. Alves
IPFN/IST-UTL

Date submitted: 09 Jul 2011 Electronic form version 1.4