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Homogeneous DBD in N2: II. Simulation in 0D and 1D approaches SERGEY PANCHESHNYI, DZIMTRY TSYGANOV, PIERRE SEGUR, LAPLACE, University of Toulouse, CNRS — In this paper we develop and validate a zero- and one-dimensional three-temperature plasmachemical model of a uniform DBD discharge in pure nitrogen at atmospheric pressure. The complete kinetic model includes 17 species (electrons, ions, neutrals) and 41 processes including excitation and ionization by electron impact, associative ionization, ion-electron recombination, and heavy species conversion. In the 0D model the electron density and the electric field are calculated using measured gap voltage and discharge current density that allows direct verification of the kinetic scheme. Using a comparison between the simulated and measured densities of N atoms, the importance of the surface dissociative electron-ion recombination process is shown. A simple analytical expression for the atom production, which provides a highly accurate description of the complete model, is presented. The role of surface processes for electric behavior of the discharge is analyzed using a self-consistent model. This 1D model is based on balance equations for charged species in the electric field which is described by Poisson's equation.

Sergey Pancheshnyi
LAPLACE, University of Toulouse, CNRS

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