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One Dimensional Model of a Planar Dielectric Barrier Discharge in Air BAHRAM MAHDAVIPOUR, Institute of Product and Process Innovation, Leuphana University Lueneburg, Germany, SEBASTIAN DAHLE, Department of Wood Science and Technology, Biotechnical Faculty, University of Ljubljana, Jamnikarjeva 101, 1000 Ljubljana, Slovenia, JENS OBERRATH, South Westphalia University of Applied Science, Department of Electric Power Engineering, Modeling and Simulation, Soest, Germany — Dielectric-barrier discharges (DBD) are devices which were first invented to generate ozone. Today, DBDs are being used in several applications such as surface modification, plasma chemical vapor deposition, excitation of CO_2 lasers, excimer lamps, plasma display panels, pollution control, gas processing, and air cleaning. Due to the complexity of chemical and physical processes involved, multidimensional fluid simulations of DBDs in air at atmospheric pressure are very time-consuming. To reduce the simulation time, a zero-dimensional (0D) simulation can be used to reduce this chemical complexity to just 50 species and 600 reactions. However, the driving frequency, the species density, and the electron temperature as a function of space are not considered in such a 0D simulation. Taking at least the spatial behavior in one direction (1D) into account raises the question if the same reduced chemical model can be applied. Thus 1D simulations with reduced chemical reactions are compared to 0D simulations in PLASIMO. The behavior of parameters like electron temperature and densities of electrons, ions, and neutral species are studied to validate the 1D simulations.

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