Study of Single Filament Dielectric Barrier Discharge in Argon

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Study of Single Filament Dielectric Barrier Discharge in Argon BAHRAM MAHDAVIPOUR, Institute of Product and Process Innovation, Leuphana University Lneburg, Germany, SEBASTIAN DAHLE, Clausthal Center of Materials Engineering, Clausthal University of Technology, Clausthal-Zellerfield, Germany, JENS OBERRATH, Institute of Product and Process Innovation, Leuphana University Lneburg, Germany — Dielectric barrier discharges are devices, which were first invented to generate ozone. Today, they have a lot of applications such as surface modification, plasma-enhanced chemical vapor deposition, excitation of CO_2 lasers and excimer lamps, plasma display panels, pollution control, as well as gas and air cleaning. At atmospheric pressure DBDs are typically filamentary, comprising a number of individual breakdown channels (micro discharges) with very short time duration of several nanoseconds. Most of the chemical effects of filamentary DBDs take place in their micro discharges. Due to that, this work focusses on the study of micro discharges at low temperature and atmospheric pressure conditions in argon to investigate its creation process. Therefore, a symmetric needle-to-needle geometry was designed, where both electrodes are covered by dielectric. A 2D simulation in COMSOL Multiphysics is presented to show the characteristics of the micro discharge. The overall discharge behavior can be validated by electrical measurements and optical emission spectroscopy, thus allowing to compare mean electron densities and energies.

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