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Simulations of pattern formation in DBDs ANANTH BHOJ, ESI US R&D, Inc 6767 Old Madison Pike, Huntsville, AL 35806, USA, VLADIMIR KOLOBOV, CFD Research Corporation, 215 Wynn Dr, Huntsville, AL 35805, USA
— Dielectric Barrier Discharges (or DBDs) are used in a variety of applications from ozone generation to plasma display panels to materials processing. DBDs occur in various forms depending on conditions such as pressure, gap length, applied voltage, frequency and gas composition. In some cases, the discharge is homogenous while in other cases it may consist of several filaments. With the latter kind, a seemingly self-organized pattern of filaments is observed in several instances. In this work, we use a 3D hydrodynamic model to investigate pattern formation in dielectric barrier discharges generated in Helium. An experimental setup similar to [1] is modeled with parallel glass plates connected to plane exterior electrodes, one of which is powered. The model addresses Poisson's equation for electric potential in the domain, multi-species charge transport equations in the discharge and the surface charge balance on dielectrics. Results from these simulations including the effect of varying discharge conditions (such as pressure, gap length, voltage and dielectric properties) on the generated patterns will be discussed.

[1] L. Stollenwerk, Sh. Amiranashvili, J.-P.Boeuf and H.-G. Purwins, Phys. Rev. Lett., 96, 255001 (2006).

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