SIMULATIONS OF INITIAL DIELECTRIC BARRIER DISCHARGES OF ARGON USING THE PIC CODE MAGIC

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We investigate the use of the commercial particle in cell (PIC) code MAGIC for simulations of Dielectric Barrier Discharges (DBD). The simulations are done in pure Argon at atmospheric pressure to avoid many of the complications that occur in air. We study DBDs with an upper electrode ush with the surface of the dielectric and also with the upper electrode above the surface of the dielectric. We consider the upper electrode with both positive and negative polarities relative to the other electrode that lies under the dielectric. The only particle creation – destruction effect we consider is the ionization of Argon by electron impact. The cross section for Ar ionization by electron impact, and the ion and electron drag cross sections used are those provided in the MAGIC code. The drag cross sections are based on BEB (binary encounter Bethe) cross sections with a low energy correction. Our simulations last only about one nanosecond due to the large number of electrons produced, which fill our computer memory. The discharge is so fast that the neutral atoms have no time to move and are considered to be at rest. We calculate the momentum imparted to the neutral gas during each time step by collisions with the ions and electrons and also the total accumulated momentum density imparted to the neutral gas during the entire simulation.