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The effect of heating mode transition on the electron energy probability function through the variation of driving frequency JUNG YEOL LEE, HYOWON BAE, HAE JUNE LEE, Pusan National University, JOHN VERBONCOEUR, Michigan State University — During the last two decades, a number of applications such as a plasma display, surface treatment, and bio-medical devices utilized sub-millimeter atmospheric pressure plasmas. Among them, the dielectric barrier discharge (DBD) is widely used as the simplest device which can sustain abnormal glow discharge with a micro-sized gap length. In this study, a particle-in-cell (PIC) simulation was selected to understand the discharge characteristics of a planar micro DBD with an input frequency from 13.56 MHz to 600 MHz. Along with two different heating modes, the alpha and the gamma mode, the sheath heating by secondary electron emission plays an important role for DBDs. The electron energy probability function (EEPF) shows a bi-Maxwellian profile in gamma mode. On the other hand, Ohmic heating is more dominant for electron temperature in alpha mode, and the increment of input frequency changes the ratio of secondary electron current to the total current through the relationship between the ion transit time and the driving period. Therefore, the transition mechanism of the EEPF in DBDs is very different from that of low pressure capacitively coupled plasmas. It means that it is possible to control the interactions between plasmas and neutral gas for the generation of preferable radicals by the variation of input frequency through the change of heating mode.

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