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The effect of frequency-dependent electron swarm parameters on fluid modeling of high-frequency CCP discharges ROCHAN UPADHYAY, SHANKAR MAHADEVAN, Esgee Technologies Inc., IKUO SAWADA, MIRKO VUKOVIC, PETER VENTZEK, Tokyo Electron Limited, LAXMINARAYAN RAJA, The University of Texas at Austin — Fluid models are computationally the most feasible approach for the multidimensional simulation of reactive CCPs. Fluid models require the specification of species reaction-rate and transport coefficients. For electrons, these closure terms are dependent on the assumed/computed EEDF that depend on the excitation frequency. However the excitation frequency dependence of these electron properties for fluid models are rarely discussed. Here we explore the significance of frequency-dependent electron transport and reaction rate coefficients for high-frequency CCP discharges. We use pre-computed electron properties from a zero-dimensional electron Boltzmann solver which are used in the simulation of an argon CCP at 60MHz and pressures of 15 mTorr and 100 mTorr. A high-resolution computational mesh is developed and used to overcome any uncertainty associated with numerical discretization. We report significant differences in the pre-computed electron reaction-rate and transport coefficients for a 60 MHz EEDF compared to direct-current EEDF or assumed Maxwellian EEDF. The effects of these differences on the discharge structure are found to be significant; clearly emphasizing the importance of using frequency-dependent electron properties in high-frequency CCP models.

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