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Simulation studies on the role of ion-enhanced field emission in micro-discharges YINGJIE LI, DAVID GO, University of Notre Dame, Department of Aerospace and Mechanical Engineering, IN 46556 — Due to its promising future for a number of applications, micro-discharges have become more and more popular in the past decade. For micro-discharges with electrode spacing < 10 μm, a very interesting feature is the possibility of electron field emission playing an important role. The short distance between the two electrodes enables a very high electric field under a reasonable electric potential. This high electric field makes field emission strong enough to serve as another electron source in the micro-discharge. This work investigates the impact of field emission by embedding it into a particle-in-cell (PIC) simulation. The well-developed Fowler-Nordheim field emission model does not take ion effects into accounts. Therefore to make it a step further, an ion-enhanced field emission model is built in this work. Parametric studies are used to assess the impact of ions on the field emission current density and other properties of the discharge itself. In addition, a revised emission model based on an ion-affected potential distribution is also implemented and is discussed in this work.

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