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Continuum Simulation of Microplasmas with Prolate Spheroid Field Emitters ABHISHEK KUMAR VERMA, AYYASWAMY VENKATTRAMAN, Department of Mechanical Engineering, University of California Merced, Merced, CA 95343, USA — In past three decades, microscale gas discharges using field emission cathodes have been very active research topics. Since the experimental observations of remarkable field emission with low applied voltage in field emission assisted (FEA) microplasmas, significant efforts have been devoted to fundamental understanding of such systems by means of kinetic and fluid simulations, though limited to one dimension model. This work aims to expand our understanding of FEA microdischarge dynamics over pre-and post-breakdown regime in complex geometries such as prolate spheroid. We performed 2D and 2D-axisymmetric simulation of direct current argon microplasma confined between a prolate spheroid tip and a planar electrode on unstructured grids. We employed fluid model with full momentum equation and simple argon chemistry for plasma simulation along with Fowler-Nordheim equation to model field emission surface. Our results show various plasma parameters with local field enhancement and their dependency on surface location and emitter height to radius aspect ratio, to provide a basis for device characterization, tip current, effective emission area etc. The simulation results are compared with existing experimental literature on Townsend and glow discharge regimes.

Abhishek Kumar Verma
Univ of California - Merced

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