

ONE-DIMENSIONAL MODELING ON THE RADIO-FREQUENCY, ATMOSPHERIC-PRESSURE GLOW DISCHARGES IN HELIUM-NITROGEN MIXTURES*

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It is reported that the radio-frequency, atmospheric-pressure glow discharges (RF APGDs) in helium-nitrogen mixtures can be obtained and sustained in the α or γ mode using the plasma generators with the water-cooled, bare-metallic electrodes¹. In this study, one-dimensional modeling on the discharge structures of the RF APGDs with different partial pressures of nitrogen in the helium-nitrogen mixtures is conducted. The calculation domain includes the sheath region and the bulk plasma region as illustrated in Fig. 1. The modeling results show that the RF APGDs for the case with a high nitrogen concentration operate in a γ mode, instead of in a α mode with a trace amount of nitrogen²; both the time averaged spatial distributions of the species number densities and the reaction pathways of the electron generation/destruction are different in different helium-nitrogen gas mixtures. The modeling results are consistent with the experimental ones qualitatively.

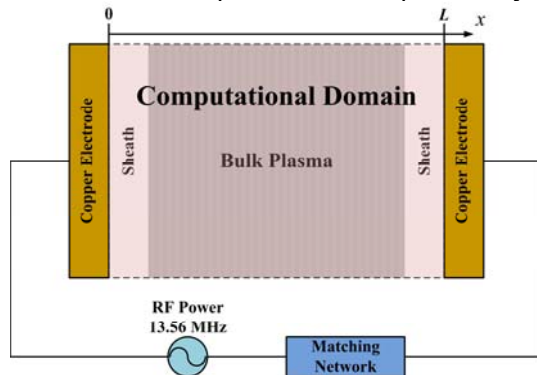


Figure 1. Schematic diagram of the calculation domain.

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2. X. Yuan and L. L. Raja, "Computational Study of Capacitively Coupled High-Pressure Glow Discharges in Helium", *IEEE Transactions on Plasma Science*, 2003, 31, pp. 495-503.

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