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**Simulation of Direct-Current Air Glow Discharge Phenomena**
SHANKAR MAHADEVAN, LAXMINARAYAN RAJA, The University of Texas at Austin — Surface plasma discharges are of increasing interest as actuators for flow control. Non-equilibrium glow discharges are particularly attractive for flow actuation since they have significantly lower power requirements compared to other discharges such as thermal arcs. While volumetric heating and electrostatic forcing can be important for flow actuation, the relative importance of each of these mechanisms needs to be understood. In this work develop a 2D computational model of air glow discharges in parallel-plate DC discharge under conditions similar to plasma flow actuator applications. The model is validated against experimental data and provides a good starting point for plasma flow actuator studies. All important positive and negative ions, radicals, and electrons are included with a finite-rate air chemistry mechanism. Results of model and comparison with experimental data are presented. Characteristics of the air glow discharge in the abnormal and normal glow discharge regime are represented well by the model. Voltage-current characteristics and charged species density profiles in the discharge are compared directly with experimental results and are shown to be in reasonably good agreement.

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