Modeling and Plasma Diagnostics of Microdischarges

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High pressure (100s of Torr) microplasma (length scale 100s of microns) discharges have potential applications as chemical microreactors, sensors, microelectromechanical systems (MEMS), and excimer radiation sources. Modeling and simulation of these systems, combined with plasma diagnostics, can provide critical information on fundamental discharge characteristics, and help extend the window of stable microdischarge operation. This talk will review the modeling and simulation methodologies used for microplasmas, with emphasis on the coupling between plasma and neutral gas flows. The effect of operating conditions on gas temperature and in turn on discharge characteristics will be discussed. Similarities and differences between microdischarges and macroscopic discharges will be detailed. Simulation predictions will be compared to experimental data obtained by space- and time-resolved plasma diagnostics of important microdischarge properties (electron density and temperature, gas temperature, excited state densities, electric fields, etc.).