Abstract Submitted
for the GEC19 Meeting of
The American Physical Society

Model-experiment comparison of radiofrequency phase resolved plasma parameters for moderate pressure capacitively coupled discharges
DAVID PETERSON, KRISTOPHER FORD, JOEL BRANDON, North Carolina State University, TRAVIS KOH, THAI CHENG CHUA, WEI TIAN, KALLOL BERA, SHAHID RAUF, PHILIP A. KRAUS, Applied Materials Inc., STEVEN C. SHANNON, North Carolina State University — Spatial profiles of plasma parameters along with voltage and current characteristics in a parallel plate capacitively coupled discharge at moderate pressures are compared with 2-dimensional fluid plasma simulation results. Plasma parameters including electron density, effective collision frequency, and probe sheath thickness are measured with a hairpin resonator probe over different pressures and powers ranging from 1.3-266 Pa and RF voltage amplitude 80-400 V in Ar, He, and N_2 plasmas driven at 13.56 MHz with a gap thicknesses of 2.54 cm. Spatial measurements are made in the axial and radial directions. Probe sheath thickness is determined using a time resolved system capable of 4 ns resolution. The high time resolution is leveraged to measure electron density and effective collision frequency in the rf cycle versus axial distance for a variety of conditions to explore powered sheath dynamics. Measurements show a region of strong electron density modulation close to the powered electrode corresponding to the rf sheath while also showing oscillations in the plasma bulk. Measurements using different floating probe geometries are compared and yield similar results, suggesting that the geometries used are sufficient to inhibit the formation of an RF sheath across relevant probe surfaces.

David Peterson
North Carolina State University

Date submitted: 05 Jun 2019 Electronic form version 1.4