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Model-Experiment Comparison of Plasma Characteristics for Moderate Pressure Capacitively Coupled Discharges DAVID PETERSON, STEVEN C. SHANNON, North Carolina State University, WEI TIAN, PHILIP A. KRAUS, KALLOL BERA, SHAHID RAUF, THAI CHENG CHUA, TRAVIS KOH, HANHONG CHEN, Applied Materials Inc., 1140 E. Arques Avenue Sunnyvale, California 94085 — 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, effective electron temperature, and sheath thickness around a hairpin resonator probe are measured over different pressures and powers ranging from 13-530 Pa and 70-420 mW/cm^2 in Ar, He, Ar-He, and N_2 plasmas driven at 27 MHz with gap thicknesses ranging from 1-4 cm. Spatial measurements are made in the axial and radial directions. Probe sheath thickness is determined using a time resolved system capable of 25 ns resolution. Effective electron temperature is determined using effective collision frequency through the plasma conductivity equation but requires assuming an EEDF. The detailed model-experiment comparison proved useful for improving understanding of plasma chemistry mechanisms in these low temperature plasmas at moderately high pressure. All analysis and data acquisition use open source python scripts which are freely available to the public.

David Peterson
North Carolina State University

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