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Electromagnetic Effect on Plasmas in Rectangular Very High Frequency Capacitively Coupled Plasma Source KALLOL BERA, SHAHID RAUF, KEN COLLINS, Applied Materials, Inc. — Capacitively coupled plasmas have been used in both etching and deposition processes in the semiconductor industry. In this study, we investigate very high frequency plasma behavior in a rectangular parallel plate capacitively coupled plasma reactor. Our plasma model includes the Maxwell equations using finite difference time domain (FDTD) formulation. Plasma current source for the Ampere's law is computed using the plasma characteristics. The plasma transport equations and the Maxwell equations are solved explicitly in time. Ar plasma at moderate pressure (a few Torr) has been simulated at 60 and 120 MHz. In this reactor, the plasma is formed in the gap between the top powered electrode and the bottom return electrode, both of which are rectangular in shape. The RF feed to the powered electrode is located at the center of the reactor. The RF return path along the outer electrode is separated from the powered electrode by a dielectric. Plasma uniformity is found to be primarily determined by the electric field distribution in the sheath/pre-sheath region. The electric field distribution, and hence plasma distribution, depend on geometric parameters, such as shape of the electrode and gap between the electrodes, and operating parameters, such as pressure, power and frequencies.

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