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Plasma Instability in Radio-Frequency Capacitively Coupled Discharge KALLOL BERA, ANKUR AGARWAL, SHAHID RAUF, JOHN FORSTER, Applied Materials, Inc. — Stationary and moving striations with spatial periodic structure have been observed in radio-frequency (RF) capacitively coupled plasmas (CCP). To understand the striation mechanism, we have incorporated thermoelectric electron energy transport effect[1] in our fluid plasma model. The thermoelectric coefficient is calculated using Bolsig+[2] for different chemistries, and is found to be the largest for Ar plasma. The thermoelectric effect reduces electron energy diffusion, which can localize the plasma and lead to periodic structures. To examine striations in capacitive plasmas, 2-dimensional Ar plasma at 13.5 MHz is first simulated without the thermoelectric effect. The charged species densities are then perturbed and growth or decay of different modes with time is observed. The periodicity of the structure is determined by the relative instability of different modes. Intermediate modes with periodicity of 4 to 15 cm are observed to grow while higher order modes decay. We will discuss effect of chemistry, power, pressure, and rf frequency to illustrate regimes where plasma instability may occur in typical CCP reactor geometries. [1]D. Mackey et. al, Appl Math Lett, p. 865, 2005. [2]G. J. M. Hagelaar and L. C. Pitchford, Plasma Sources Sci. Technol., p. 722, 2005.

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