Abstract Submitted
for the GEC12 Meeting of
The American Physical Society

Plasma characteristics in non-sinusoidally excited CCP discharges TREVOR LAFLEUR, JEAN-PAUL BOOTH, LPP Ecole Polytechnique — Using particle-in-cell (PIC) simulations we perform a characterization of the plasma response to positive pulse-type voltage excitations (with a repetition frequency of 13.56 MHz) in a geometrically symmetric CCP reactor (with a gap length of 2 cm) operated with argon (for pressures between 20-500 mTorr). Use of these non-sinusoidal waveforms generates an electrical asymmetry effect in the system, which necessitates the formation of a DC bias. This DC bias, together with the shape of the voltage waveforms used, produces a number of new phenomena that are not present in typical sinusoidal discharges: (1) the plasma density and ion flux can be increased as the pulse width is reduced, (2) a significant asymmetry in the ion fluxes to the powered and grounded electrodes develops as the pressure increases, (3) the average ion energy striking the grounded electrode remains low and approximately constant as the pulse width decreases, and (4) the sheath at the grounded electrode never fully collapses; electrons are no longer lost in sharp pulses, but escape essentially throughout the rf cycle. Effects (1) and (3) above offer the possibility for a new form of control in these types of discharges, where the ion flux can be increased while the ion energy on the grounded electrode can be kept small and essentially constant. This effect has recently been exploited to control the crystallinity of silicon thin films [1], where the low ion bombarding energy was found to improve the quality of films grown.

[1] Johnson E V, Pouliquen S, Delattre P A, and Booth J P, *J. Non-Cryst. Solids* 2012, in press.

Trevor Lafleur
LPP Ecole Polytechnique

Date submitted: 12 Jun 2012 Electronic form version 1.4