Abstract Submitted
for the GEC16 Meeting of
The American Physical Society

Selective deposition for "chamber clean-free" processes using tailored voltage waveform plasmas JUNKANG WANG, ERIK V. JOHNSON, LPICM, CNRS, cole Polytechnique, Universit Paris Saclay — Tailored Voltage Waveforms (TVWs) have been proven capable of creating plasma asymmetries in otherwise symmetric CCP reactors. Particularly, sawtooth TVWs (described as having strong slope-asymmetry due to different voltage rise/fall slope) can lead to different sheath dynamics, thus generating strongly asymmetric ionization near each electrode. To date, research concerning the slope-asymmetry has only focused on single-gas plasmas. Herein, we present a study looking at $SiF_4/H_2/Ar$ mixtures to investigate silicon thin film deposition. The resulting surface process depends strongly on multiple precursors, and the deposition requires a specific balance between surface arrival rates of SiF_x and H. For a certain gas flow ratio, we can obtain a deposition rate of 0.82Å/s on one electrode and an etching rate of 1.2Å/s on the other. Moreover, the deposition/etching balance can be controlled by H_2 flow and waveform amplitude. This is uniquely possible due to the mixed-gas nature of the process and localized ionization generated by sawtooth TVWs. This encourages the prospect that one could choose process conditions to achieve a variety of desired depositions on one electrode, while leaving the other pristine.

Junkang WANG
LPICM, CNRS, cole Polytechnique, Universit Paris Saclay

Date submitted: 08 Jun 2016 Electronic form version 1.4