Abstract Submitted
for the GEC05 Meeting of
The American Physical Society

Global Model of Electronegative Discharges for Neutral Radical Control SUNGJIN KIM, M.A. LIEBERMAN, A.J. LICHTENBERG, University of California, Berkeley, J.T. GUDMUNDSSON, University of Iceland, Reykjavik, Iceland — Control and reduction of the ratio of neutral radical flux to ion flux at the wafer surface is required for the next generation plasma etching processes in the microelectronics industry. To explore these processes, the electronegative plasmas driven by steady power and by time-modulated power, with oxygen as the feedstock gas, have been investigated utilizing volume-averaged (global) models of a cylindrical plasma discharge. The variations of the time-average flux ratio of oxygen neutrals to O_2^+ ions depending on the chamber geometry and power modulation conditions were examined using a simple model with uniform spatial profiles and a new model with non-uniform spatial profiles, and the results from the models were compared. In both models, at a fixed duty-ratio, the flux ratio of neutrals to ions is found to have a minimum value as the pulse period is varied, with the minimum value decreasing as the duty-ratio decreases. The flux ratio is reduced in the chamber geometry with lower aspect ratio, and the pulse period that yields minimum value also decreases. In future work, we will compare the simulation results with measured experimental results.

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Date submitted: 10 Jun 2005 Electronic form version 1.4