Abstract Submitted
for the GEC11 Meeting of
The American Physical Society

Modeling of Interactions between Surface properties, DC Self Bias and Plasma Stability in PECVD Tools FEDERICO GALLI, DOUGLAS KEIL, EDWARD AUGUSTYNIAK, Novellus Systems Inc. — PECVD tools employing capacitively coupled plasma (CCP) sources are widely used in the semiconductor industry to deposit low-k dielectric materials. Power coupling in a CCP reactor is dominated by the plasma-sheath-surface dynamics. The properties of the electrode and other plasma-bounding surfaces, as well as the amount and type of material deposited thereon, affect such dynamics by modifying locally the plasma density, the electron temperature, and the DC self bias. Because PECVD tools are depositing tools, changes to the plasma properties due to surface modification are intrinsic of the process and unavoidable. The purpose of this work is to study these interactions between surface properties, secondary electron emission, DC self bias, plasma density and electron temperature by means of a fluid-type plasma model. Furthermore, the correlation between modeling results and some experimental results as a function of process parameters and chamber conditioning are reported and discussed.

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Date submitted: 29 Aug 2011 Electronic form version 1.4