Abstract Submitted
for the GEC06 Meeting of
The American Physical Society

Hafnium Oxide Film Synthesis via Laser Ablation Plasma Ion Deposition[1] N.M. JORDAN, R.M. GILGENBACH, L.M. WANG, S. ZHU, M. ATZMON, Y.Y. LAU, Plasma, Pulsed-Power, and Microwave Lab, Nuclear Engineering and Radiological Sciences Dept., University of Michigan, M.C. JONES, Sandia National Labs — This research investigates the feasibility of synthesizing thin films of hafnium oxide via laser ablation plasma ion deposition (LAPID). HfO_2 is of great interest as a high dielectric constant material in the semiconductor fabrication industry. Experiments are underway to deposit and implant films of hafnium and hafnium-oxide on silicon substrates. A KrF laser (400 mJ @ 248 nm) ablates solid Hf foils in an oxygen environment or sintered pellets of hafnium-oxide in vacuum. Silicon substrates can be biased (+ or -, either pulsed or DC) by voltages up to 10 kV for ion implantation and deposition. Experiments study correlations among parameters such as laser energy, film thickness, background gas pressure, film composition, and ion energy. Ablation plasma plumes are characterized by optical emission spectroscopy. Composition and morphology of deposited films are analyzed by SEM, TEM, X-ray Energy Dispersive Spectroscopy, X-ray Photoelectron Spectroscopy, X-ray diffraction and Atomic Force Microscopy. Film deposition rates are estimated to be on the order of 0.055 nm/pulse at a laser repetition rate of 15 pulses/s, equating to 8 nm/s.

[1]Supported by the AFOSR MURI on Cathodes and RF Windows. NMJ is partially supported by an Applied Materials Graduate Fellowship.

Nicholas Jordan
Plasma, Pulsed-Power, and Microwave Lab, Nuclear Engineering and
Radiological Sciences Dept., University of Michigan

Date submitted: 22 May 2006 Electronic form version 1.4