Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Electron Spin Resonance Observation of Si/Dielectric Interface Traps in Fully Processed Metal Gate Hafnium Oxide Field Effect Transistors THOMAS PRIBICKO, JASON CAMPBELL, PATRICK LENAHAN, Pennsylvania State University, WILMAN TSAI, Intel Corporation — Hafnium oxide is arguably the leading candidate for SiO_2 replacement in future MOS transistors. Using spin dependent recombination (SDR), we have investigated the dominating (100) Si/HfO_2 interface defects on fully processed metal/gate transistors. We find that the densities of these defects may be altered greatly by gate dielectric stressing. Transistor SDR spectra display a g-value of 2.0051when the magnetic field is perpendicular to the (100) Si surface. Although sample rotation in the magnetic field alters the average g-value, we are as yet unable to clearly resolve the SDR pattern into several anticipated lines. The observed defects appear to be similar, but probably not identical to P_{b0} centers and may be a superposition of P_{b1}- and P_{b0}-like centers. After in-situ gate voltage stressing at modest gate voltages, we observed that the SDR amplitude of the (100) Si/HfO_2 interface P_b-like spectrum increases with the application of an increasing gate voltage. A hysteretic behavior in the SDR response was observed when modest negative and positive voltages were applied to the gate. This suggests that the application of modest gate voltages changes the chemical/physical nature of the observed defect. Work at Penn State was supported by the Semiconductor Research Corporation through Intel Corporation Funding.

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Date submitted: 04 Jan 2005

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