Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Exploration of Defects in 4H-SiC MOSFETs via Spin Dependent Charge Pumping MARK ANDERS, PATRICK LENAHAN, Pennsylvania State Univ, AIVARS LELIS, U.S. Army Research Laboratory — 4H-SiC MOSFETs have great promise for use in high temperature and high voltage applications. Unfortunately, defects at the SiC/SiO_2 interface reduce the performance of these devices. Previously, our group utilized electrically detected magnetic resonance (EDMR) detected via spin dependent recombination (SDR) to identify such SiC/SiO_2 interface defects utilizing the bipolar amplification (BAE) biasing scheme; we observed SiC silicon vacancies, E-prime centers, and hydrogen complexed E-prime centers. All of these defects must have levels around the middle of the SiC band gap because they are effective recombination centers. We expanded our studies to include EDMR detection via spin dependent charge pumping (SDCP) at low field, X band, and K band, allowing EDMR exploration of nearly the entire 4H-SiC band gap. Perhaps the most important finding of the (nearly) full band gap measurements is the absence of the carbon dangling bond spectrum in the SDCP. Additionally, in nMOSFETs, we observe an SDCP EDMR spectrum dominated by a silicon vacancy, whereas in pMOSFETs, we also observe a strong, nearly isotropic single line spectrum with g = 2.00244 and 2.00248 when the c-axis is nearly parallel and perpendicular to the magnetic field, respectively. The results suggest that silicon vacancy centers dominate nMOSFET interfaces whereas additional defects clearly play important roles in pMOSFETs.

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Date submitted: 24 Nov 2015

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