Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Electrical characterization of epitaxial MgO/SiC capacitor structures AGHAM POSADAS, FRED WALKER, CHARLES AHN, Yale University, TREVOR GOODRICH, ZHUHUA CAI, KATE ZIEMER, Northeastern University — Epitaxial heterostructures of MgO (111) have been grown on hydrogen-cleaned 6H-SiC (0001) substrates and characterized using capacitance vs. voltage (C-V) and current vs. voltage (I- V) measurements. Low frequency capacitance measurements of MgO/SiC under strong accumulation conditions as a function of MgO layer thickness show that the epitaxial MgO has a dielectric constant of 10. The C-V measurements show modulation of the SiC from accumulation to depletion, consistent with the wafer conductivity type. The density of interface states was determined from ac conductance vs. frequency measurements, indicating a density of 6 x 10^{11} eV^{-1} cm^{-2} at an energy level close to the conduction band edge, similar to what has been reported for native SiO_2 capacitor structures. In order to determine the dielectric breakdown field of the epitaxial MgO, leakage current as a function of gate voltage was measured for the capacitor structures. The median gate voltage at which the MgO breaks down was found to correspond to an electric field of 12 MV/cm, similar to that of bulk, single crystal MgO. These results show that epitaxial MgO has potential for use as a gate dielectric in SiC MOSFET applications.

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Date submitted: 23 Nov 2008

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