Abstract Submitted
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Characterization of the oxide-semiconductor transition layer in NO, P, and N-plasma passivated 4H-SiC/SiO_2 structures using transmission electron microscopy[1] JOSHUA TAILLON, JOONHYUK YANG, University of Maryland, CLAUDE AHYI, JOHN WILLIAMS, Auburn University, JOHN ROZEN, LEONARD FELDMAN, Vanderbilt University, TSVETANKA ZHELEVA, AIVARS LELIS, US Army Research Laboratory, LOURDES SALAMANCA-RIBA, University of Maryland — The 4H-SiC/SiO_2 interface in MOSFET devices contains a high density of electrically active traps. Recent work has revealed an inverse relationship between the SiC-SiO_2 transition layer width and FET channel mobility. Interfacial N and P, introduced by nitric oxide (NO) anneals, nitrogen plasma (N2P), or phosphosilicate glass (PSG) passivations improve carrier mobility, but a relationship to transition layer width is lacking. We present a characterization of the SiC/SiO_2 transition layer as a function of NO anneal time using high resolution transmission electron microscopy (HRTEM), high-angle annular dark-field scanning TEM (HAADF-STEM), and electron energy-loss spectroscopy (EELS). The transition layer was measured with HRTEM and HAADF-STEM and characterized by the evolution of the C/Si and O/Si composition ratios and the Si-$L_{2,3}$ edge in the EEL spectra across the interface. We show an inverse relationship of NO anneal time and transition layer width, which correlates with improved channel mobility, increased N interfacial density, and reduced interface trap density. No excess C was noted at the interface. NO annealed samples are compared to N2P and PSG passivations.

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