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Revealing Hidden Interfacial States in NO Passivated 4H-SiC/SiO_2 Structures using TEM-EELS and XPS[1] JOSHUA TAILLON, University of Maryland, College Park, SARIT DHAR, Auburn University, GANG LIU, LEONARD FELDMAN, Rutgers University, TSVETANKA ZHELEVA, AIVARS LELIS, US Army Research Laboratory, LOURDES SALAMANCA-RIBA, University of Maryland, College Park — The interface between *4H*-SiC and SiO_2 in metal oxide semiconductor (MOS) devices contains a high density of electrically active defects, which adversely affect SiC microelectronic devices. Various treatments and altering the substrate's crystallographic orientation can improve electronic performance. We have previously shown an inverse relationship between nitric oxide (NO) anneal time and the width of the transition layer at this interface (w_{TL}).[2]More recent work analyzing w_{TL} has revealed much narrower interfaces that do not appear to narrow when subjected to an NO post-oxidation anneal, contradicting expectations. To further explore these interfaces, high resolution transmission electron microscopy and spatially resolved electron energy-loss spectroscopy (EELS) have been used. In addition, X-ray photoemission spectroscopy measurements were taken at the interface. Advanced EELS analysis via machine learning techniques has revealed interfacial bonding states for different post-oxidation annealing processes. The nature of these interfacial states is compared for devices made on substrates with different orientations and for NO post-oxidation annealing. [2]J. Taillon *et al., J. Appl. Phys.* **113,** 044517 (2013).

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