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Physical and electrical interface structure of crystalline oxides on GaN YOSI BASON, FRED J. WALKER, Center for Research on Interface Structure and Phenomena and Department of Applied Physics, Yale University, New Haven, CT, AGHAM B. POSADAS, University of Texas at Austin, CARLOS A.F. VAZ, VICTOR E. HENRICH, CHARLES H. AHN, Center for Research on Interface Structure and Phenomena and Department of Applied Physics, Yale University, New Haven, CT — High electron mobilities at semiconductor-oxide interfaces are important for heterostructure field effect transistor applications, depending critically on the electronic and physical structure of the interfaces. Here, we report on the growth and characterization of crystalline oxides of (Mg,Ca)O deposited epitaxially on GaN using molecular beam epitaxy. By carefully engineering the MgO-GaN interface through a combination of precise layer-by-layer control of the deposition and lattice matching to the GaN substrate through alloying of the MgO with CaO to reduce and eliminate dislocations, a high breakdown field can be achieved. In addition, careful substrate surface preparation is a key element in producing high quality films. We discuss an approach for generating carbon-free surfaces for epitaxy and show surface and interface characterization of (Mg,Ca)O/GaN films using capacitance-voltage measurements, atomic force microscopy, and x-ray scattering.

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