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Atomic-scale evolution of interfacial electronic band alignment in epitaxial Gd_2O_3 on GaAs (100) B.C. HUANG, Y.P. CHIU, M.C. SHIH, Department of Physics, National Sun Yat-Sen University, Kaohsiung, 80424, Taiwan, J.Y. SHEN, P. CHANG, T.H. CHIANG, Department of Materials Science and Engineering, National Tsing Hua University, Hsinchu, 30013, Taiwan, C.S. CHANG, Institute of Physics, Academia Sinica, Taipei, 10617, Taiwan, M.L. HUANG, National Taiwan University, and National Tsing Hua University, Taiwan, M. HONG, Department of Materials Science and Engineering, National Tsing Hua University, Hsinchu, 30013, Taiwan, J. KWO, National Taiwan University, and National Tsing Hua University, Taiwan — Direct imaging of the atomic-scale configuration and interfacial electronic band alignment in epitaxial Gd_2O_3 high κ oxides grown on GaAs (100) has been demonstrated using cross sectional scanning tunneling microscopy and spectroscopy. Measurements of the local density of states characteristics with atomic precision enabled us to determine the evolution of electronic properties in passivating the Gd_2O_3/GaAs hetero-interface. Close examinations suggested excellent electrical passivation at this interface, with low interfacial states and low leakage current density. In addition, from the local electronic states across the gate oxides, the spatial extent of the GaAs wavefunctions extended into the gate dielectric situates a minimum thickness of 0.8 nm for the Gd_2O_3 gate capacitance.

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