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Thermal oxidation of Si/SiGe heterostructures for use in quantum dot qubits SAMUEL F. NEYENS, RYAN H. FOOTE, T. J. KNAPP, THOMAS MCJUNKIN, D. E. SAVAGE, M. G. LAGALLY, S. N. COPPERSMITH, M. A. ERIKSSON, Wisconsin Institute for Quantum Information, University of Wisconsin-Madison — Here we demonstrate dry thermal oxidation of a Si/SiGe heterostructure at 700°C and use a Hall bar device to measure the mobility after oxidation to be 43,000 $cm^2V^{-1}s^{-1}$ at a carrier density of 4.1×10^{11} cm^{-2}. Surprisingly, we find no significant reduction in mobility compared with an Al_2O_3 device made with atomic layer deposition on the same heterostructure, indicating thermal oxidation can be used to process Si/SiGe quantum dot devices. This result provides a path for investigating improvements to the gate oxide in Si/SiGe qubit devices, whose performance is believed to be limited by charge noise in the oxide layer. This work was supported in part by ARO (W911NF-12-0607) and NSF (DMR-1206915 and PHY-1104660). Development and maintenance of the growth facilities used for fabricating samples is supported by DOE (DE-FG02-03ER46028). This research utilized NSF-supported shared facilities at the University of Wisconsin-Madison.

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