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Fabrication and characterization of gate-defined quantum dots in Si/SiGe nanomembranes T.J. KNAPP, ROBERT T. MOHR, YIZE STEPHANIE LI, RYAN H. FOOTE, XIAN WU, DAN R. WARD, DONALD E. SAVAGE, M.G. LAGALLY, SUSAN N. COPPERSMITH, M.A. ERIKSSON, University of Wisconsin-Madison, Madison, Wi 53706 — We have fabricated gate-defined quantum dots in Si/SiGe heterostructures grown on single crystal nanomembranes, implementing strain relaxation by release into liquid solution. Such heterostructures are much more uniform than those grown using conventional strain relaxation, and they therefore offer a promising path to the fabrication of large numbers of nearly identical quantum dots. Conventional strain-grading methods result in lateral strain inhomogeneities and mosaic tilt (small rotations of the crystal axes from location to location), phenomena that make the heterostructure nonuniform across a wafer. We show that nanomembranes, which enable the formation of Si/SiGe heterostructures that are free of such problems, are robust enough for successful fabrication of quantum dots defined by two layers of electrostatic gates separated by an Al_2O_3 dielectric layer. We report electrical characterization of these quantum dots at cryogenic temperatures. This work was supported in part by ARO (W911NF-12-0607), NSF (DMR-1206915), and the United States Department of Defense. The views and conclusions contained in this document are those of the author and should not be interpreted as representing the official policies, either expressly or implied, of the US Government.

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