

Abstract Submitted
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Elastically Strain-Relaxed GaAs/InGaAs/GaAs Heterostructures on GaAs(001)¹ D.L. OWEN, D. LACKNER, O.J. PITTS, S.P. WATKINS, P.M. MOONEY, Simon Fraser University — Engineered substrates with surface regions having an in-plane lattice parameter different from that of available semiconductor wafers are of interest to extend the properties of semiconductor devices. This was achieved by bonding strain-relaxed GaAs/In_{0.08}Ga_{0.92}As/GaAs structures on GaAs(001) substrates. Pseudomorphic heterostructures having a lattice mismatch of 0.56% were grown by metal-organic chemical vapor deposition (MOCVD) and patterned using conventional photolithography to define arrays of 10 or 20 micron square structures. A sacrificial AlAs layer was then removed by selective etching with HF. During etching, the strained structures relax elastically, without introducing misfit dislocations, and bond weakly in-place to the substrate. The degree of strain relaxation of the InGaAs layer is determined by the relative thickness of the GaAs and InGaAs layers in agreement with a force balance model.² The bond was then strengthened by annealing at 400°C for 2hrs, while stabilizing the surface with TBAs in the MOCVD reactor. The increase in the in-plane lattice parameter of the bonded structures compared to the GaAs substrate was 0.25-0.44%.

¹National Science and Engineering Research Council

²G.M. Cohen, et al., App. Phys. Lett. **86**, 251902 (2005).

Patricia Mooney
Simon Fraser University

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