Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Formation of Micro Tubes from Strained SiGe/Si Heterostructures H. QIN, N. SHAJI, N.E. MERRILL, HYUN S. KIM, R.C. TOONEN, R.H. BLICK, Laboratory of Molecular-scale Engineering, Department of Electrical and Computer Engineering, University of Wisconsin-Madison, D. SAVAGE, M.G. LAGALLY, Department of Materials Science and Engineering, University of Wisconsin-Madison, G. CELLER, Soitec USA Inc. 2 Centennial Drive, Peabody, MA 01960, USA — We report the formation of arrays of micrometer-sized SiGe/Si tubes by releasing strained SiGe/Si heterostructures from substrates. The silicon oxide sacrificial layer is etched by hydrofluoric acid buffered with ammonia fluoride. Because of the dynamic curvature change of the bilayer, the etching process deviates from the conventional ransport-controlled regime to the kinetic-controlled regime. A slow symmetric and a fast asymmetric etching mode are identified. The fast mode is associated with asymmetric surface deformation. Large etch channels are induced and etching becomes reaction controlled. In the slow etching process, bilayers are symmetrically deformed and retain mostly the initial surface pattern. A crossover from the transport-controlled (symmetric) etching to kinetic-controlled (asymmetric) etching is observed when the size of the bilayers becomes much larger than the curvature radius. Dispersion in etch rate is directly related to the degree of asymmetry in surface deformation. Using a micro manipulator, SiGe/Si tubes are assembled onto a micro-strip line for radio-frequency characterizations.

Laboratory of Molecular-scale Engineering, Department of Electrical and Computer Engineering, University of

Date submitted: 21 Dec 2004 Electronic form version 1.4