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Dislocation-free, uniformly strained Si fabricated by Si nanomembrane (SiNM) technology[1] CHANAN EUARUKSAKUL, ZHIWEI LI, DONALD E. SAVAGE, MAX G. LAGALLY — It is known that the interface of a thin film with the substrate on which it is grown plays an important role in dislocation nucleation and kinetic critical thickness. A crystalline-amorphous interface reduces the line energy of dislocations and makes strained structures on SiO_2 [e.g., strained-Si-on-insulator (sSOI) or a strained SiGe film grown on SOI], susceptible to dislocation formation. We describe fabrication of elastic strain-sharing Si nanomembranes and demonstrate that these strained structures are more thermally stable than strained structures on noncompliant substrates. Our studies with low-energy electron microscopy (LEEM) and x-ray absorption spectroscopy (XAS) show that the structures have a more uniform strain than the strained Si fabricated by conventional SmartCut® sSOI technology.

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