Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Relationship between Strain and Band Structure in Strained-Si Nanomembranes FENG CHEN, CHANAN EUARUKSAKUL, MING-HUANG HUANG, DON SAVAGE, BING-JUN DING, FRANZ HIMPSEL, MAX LAGALLY — The influence of uniaxial and in-plane biaxial strain on the conduction bands of Si is explored using elastically strained single-crystal Si (SiNMs) and high-resolution x-ray absorption measurements (XAS). Strain alters the band structure and hence the mobility of charge carriers, as well as band offsets in heterostructures. In addition to the biaxial lattice-induced tensile strain in SiNMs, their extreme thinness (<100 nm) makes them flexible, allowing us to strain the membranes by mechanically bending them (on the host onto which they are transferred). We use UV Raman to determine the amount of strain and XAS with the Si2p-to-conduction band (CB) transition to measure energy shifts and the degeneracy splitting of several CB valleys. The strain-induced splitting of the CB minimum and the energy shifts of two higher CBs near L1 and L3 are clearly resolved. [1] CB shifts and 2p core level shifts for uniaxial strain in different directions and biaxial strain in SiNMs are measured and contrasted, and compared to theory where it exists. Supported by DOE and NSF
[1] Euaruksakul, C., Lagally M., et al, P.R.L. 101, 147403(2008)

Feng Chen

Date submitted: 29 Nov 2008 Electronic form version 1.4