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Electronic Structure of Conduction Bands in Strained Si Nanomembranes[1] C. EUARUKSAKUL, Z. LI, C.S. RITZ, B. TANTO, D.M. COTTRILL, M.-H. HUANG, F. CHEN, D.E. SAVAGE, University of Wisconsin-Madison, F. LIU, University of Utah, F.J. HIMPSEL, M.G. LAGALLY, University of Wisconsin-Madison — We observe energy shifts of several conduction bands and a splitting of the conduction band minimum in elastically strained Si(001) and Si(110) Si nanomembranes (NMs) using X-ray absorption spectroscopy from the Si 2p core level. The surface sensitivity of absorption spectroscopy with electron yield detection makes the method suitable for studying very thin strained layers. Elastically strained NMs are dislocation free and thus provide an excellent model for determining the relationship of energy levels and strain. We measure the change in the global conduction band minima near the six X-points and also higher minima at the L and Γ points, which yield information about the direction of the absolute energy shift due to the strain. Quantitative values of the level positions, including the core levels, are provided and compared to theory.

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