X-RAY ABSORPTION MEASUREMENTS OF STRAINED-SILICON-ON-INSULATOR (SSOI)

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Because of a large enhancement of the mobility of electrons, strained silicon (sSi) permits a significant improvement in the performance of electronic devices. Much work has been done on the compressively strained silicon-germanium alloys, but relatively few results exist on the electronic structure of tensilely strained silicon. We present a comparison of x-ray absorption measurements of tensilely strained Si-on-insulator (sSOI) and Si-on-insulator (SOI) fig.1.

![Fig.1](image-url)

Fig.1 Si 2p absorption edges for a relaxed silicon on insulator (SOI) film compared to a strained silicon on insulator (sSOI) film on a relaxed Si₀.₈Ge₀.₂ substrate. The two onsets (labeled 2p₃/₂ and 2p₁/₂) correspond to transitions from the spin-orbit split Si 2p level into the conduction band minimum $\Delta$.

We find that, although the conduction band minimum (CBM) splitting and shift match theoretical predictions and other measurements, the 2p core level also shifts due to the strain, something that had not been experimentally observed. Because x-ray absorption measures the density of empty states in the top several nanometers of a material, it is ideal for measuring the state of strain on the surface. We relate our results to our ongoing work on elastically relaxed free-standing membranes made from SiGe/Si layers. [1]

[1] M. Roberts et al., in preparation

Research supported by NSF MRSEC. Research conducted at the Synchrotron Radiation Center, University of Wisconsin-Madison, which is supported by the NSF under Award No. DMR-0084402