Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Measurement of the Full State of Stress of Silicon with Micro-Raman Spectroscopy STEPHEN HARRIS[1], ANN O'NEILL, WEN YANG, PETER GUSTAFSON, JAMES BOILEAU, Ford Research and Advanced Engineering, W.H. WEBER, University of Michigan, BHASKAR MAJUMDAR, New Mexico Tech, SOMNATH GHOSH, Ohio State University — Micro-Raman spectroscopy has been widely used to measure local stresses in silicon and other cubic materials. However, a single (scalar) line position measurement cannot determine the complete stress state unless it is has a very simple form, such as uniaxial. Previously published micro-Raman strategies designed to determine additional elements of the stress tensor take advantage of the polarization and intensity of the Raman scattered light, but these strategies have not been validated experimentally. In this work we test one such stategy [S. Narayanan, S. Kalidindi, and L. Schadler, *JAP*. **82**, 2595 (1997)] for rectangular (110)- and (111)-orientated silicon wafers. The wafers are subjected to a bending stress, and the state of (plane) stress is modeled with ABAQUS. The Raman shifts, intensities, and polarizations are calculated using previously published values for silicon phonon deformation potentials. The experimentally measured values for σ_{xx}, σ_{yy}, and τ_{xy} at the silicon surface are in good agreement with those calculated with the ABAQUS model.

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Date submitted: 19 Nov 2004 Electronic form version 1.4