# Wafer Bond Alignment and Strength Characterization

## Personnel
C. Tsau and H. Verma (C.V. Thompson, M.A. Schmidt and S.M. Spearing)

## Sponsorship
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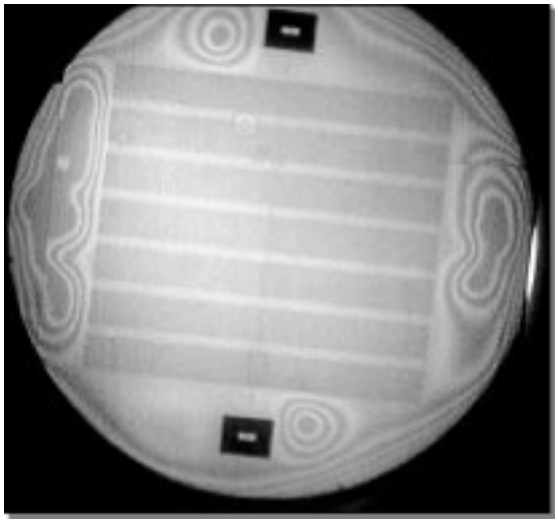
We are exploring the fundamental properties of a wafer-level thermocompression bond. This bond is performed by pressing two silicon wafers with thin patterned gold films together in such a way that the gold films deform and bond. The bond is performed at 300-350C, permitting it to be performed after integrated circuits and MEMS devices have been formed on the wafer. In addition, because the bond layers are conductors, the bonding layers may also be used for local signal routing. Lastly, it is possible that the bonding can be performed in a vacuum, which can be critical to the operation of some inertial sensors.

Thus far, we have established a wafer-level bonding protocol for 4" wafers using a commercial bond tool (Electronic Visions). Additionally, we have developed a bond strength measurement technique which permits a direct measure of the de-bond energy. The technique utilizes a four point bending configuration in which the load deflection characteristics of a bonded sample are measured as a crack propagates along the bonded interface. A load plateau is measured, from which the bond strength is extracted. Ongoing work include mapping the bond quality over a range of process conditions, bonding in vacuum, and assessing the local intercon-



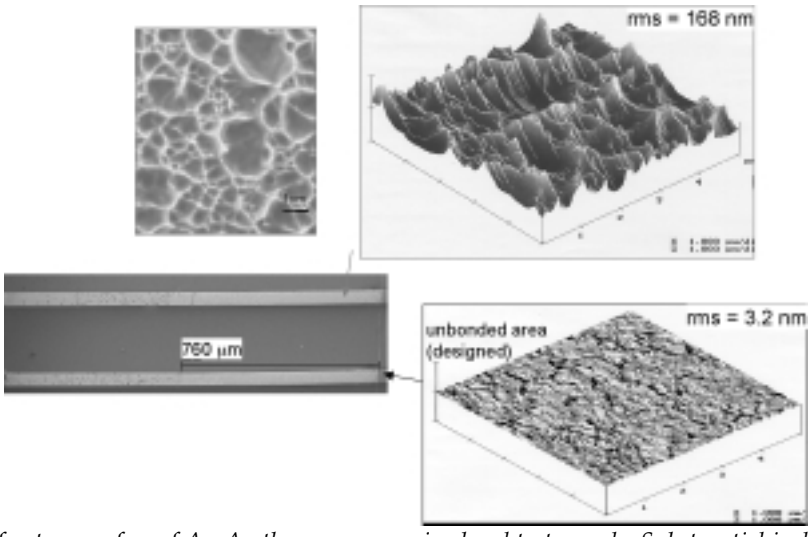



*Fig. 1a: Image of fracture surface of Au-Au thermocompression bond test sample. Substrantial inelastic deformation is evident, indicating a high quality bond.*