A Comparison of Interfacial Fracture Energy of Bonded Wafers using A Micromechanics Indentation Approach and Crack Propagation Technique

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Abstract

The interfacial fracture energy, Gic, of hydrophilcally bonded silicon wafers has been quantitatively measured utilizing a micro-indentation technique based upon a classical Vickers indentation scheme [1,2]. Highly localized measurements of Gic have been made and compared to the intrinsic fracture energy of silicon. These measurements have been performed on specimens of hydrophillic wafers bonded for different times and temperatures. Shorter times at lower annealing temperatures have resulted in a markedly lower interfacial fracture energies than longer time at higher temperatures. These results indicate that physically-based process development maps may be envisaged that relate the kinetics of mass diffusion in silicon to the resulting changes in fracture energy of the interface between bonded wafers. Furthermore, the results of the micro-indentation technique were compared with crack propagation measurements [3]. Crack propagation proved to be an unreliable measurement for samples that had been annealed at high temperatures (T>900°C). However, micro-indentation measurements confirmed that the samples had interfacial energies similar to those of covalently bonded silicon.

In this talk, a comparison of the two interfacial energy measurement techniques will be discussed.

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References

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