

Preliminary Characterisation of Low-Temperature Bonded Copper Interconnects for 3-D Integrated Circuits.

H.L. Leong^a, C.L. Gan^a, K.L. Pey^a, Tsang Chi-fo^b, Carl V. Thompson^c, Li Hongyu^b

a: Department of Material Engineering, Nanyang Technological University, Singapore

b: Silicon Processing Technology Department, Institute of Microelectronics, Singapore

c: Department of Material Science and Engineering, Massachusetts Institute of Technology, Cambridge, USA

Abstracts – Three dimensional (3-D) integrated circuits can be fabricated by bonding previously processed device layers using metal-metal bonds that also serve as layer-to-layer interconnects. Bonded copper interconnects test structures were created by thermocompression bonding and the bond toughness was measured using the four-point test. The effects of bonding temperature, physical bonding and failure mechanisms were investigated. The surface effects on copper surface due to pre-bond clean (with glacial acetic acid) were also looked into. A maximum average bond toughness of approximately 35 J/m^2 was obtained bonding temperature 300 C.