

Infrared spectroscopic investigations of the buried interface in silicon bonded wafers

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Abstract. Non-destructive multiple internal transmission and multiple internal reflection infrared (IR) measurements were used to investigate the silicon wafer bonding process. IR measurements performed *ex situ* and *in situ* reveal the chemical reactions which take place during annealing at the interface of silicon bonded wafers with thin native (Si/Si) or thick thermally grown interfacial oxide (Si–SiO₂/Si). A comparative analysis of the IR response of the buried interface in low temperature silicon bonded wafers prepared using different surface activation treatments is presented. The evolution with annealing temperature of the chemical species at the interface is used to explain the bonding mechanism of Si wafers in the temperature range of 30–400 °C. Very good bonding (~3000 mJ m⁻²) at 200 °C was obtained between pairs of Si wafers covered with native and thermally grown oxide in the case when the wafers were treated by reactive ion etching oxygen plasma.

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