Studies on Microvoids at the Interface of Direct Bonded Silicon Wafers

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Abstract

The microvoids at the interface of direct bonded silicon wafers were studied in view of surface damage, micro particles, and micro gas trap. The microvoids due to surface damages at the edge of wafer and micro particles could be mostly avoided by giving careful handling to wafers and using fresh hydrophillizing solution, respectively. The micro gas trap voids, mostly with diameters in the range of 20-400 μm, have been observed at all of Si-Si, Si-SiO_2, and SiO_2-SiO_2 bonding interfaces. The effects of highly pressurized 50°C nitrogen flow on wafer surface, ambient gases at mating, and annealing temperature on the generation of micro gas trap voids were studied to clarify the causes of micro gas trap voids. These studies presented that the tendency of the generation of micro gas trap void sensitively depended upon the process conditions related to the surfaces of wafers, especially on the heated high pressure nitrogen showering on the surface before mating.