CHAPTER SEVEN : CONCLUSIONS

OISF dimension and density as a function of surface removal and blasting pressure were studied on sand blasted wafers with different surface orientations. The length of (100) wafer's OISF is longer than the length of (111) wafer. OISF length for (100) and (111) wafers were 12~13μm and ~5μm respectively after delineation by preferential etchant. These measured lengths agreed with the calculated length using $L\ (\mu m) = (A)\ t^{n} \exp(-Q/kT)$, where Q, t, n, k, T and A were the activation energy of OISF growth, oxidation time, number exponent, Boltzmann constant, absolute temperature and constant respectively.

When delineated OISFs were further etched using the same etchant, their length and width increased linearly with surface removal. Generally OISF width increased faster with surface removal compared to OISF length. OISF length was almost unchanged after 200 seconds further etching. Besides being comparable in width after delineation, OISF width for (100) and (111) wafers remained comparable at higher surface removal by repeated preferential etching. This was due to the fact that OISF fault plane was (111) regardless of wafer surface orientation of sand blasted wafers.

The depth of each individual OISF formed cannot be measured correctly using AFM because the measurement was limited by the inclined OISF fault planes and the shape and the profile of silicon probe tip used. OISF depth measurement using angular polishing technique found that OISF depth was affected by crystal orientation. Higher depth was measured on (100) wafer compared to (111) wafer.

The OISF depth for (100) wafer was 3.5μm while the depth measured on (111) wafer was 2.0μm. However regardless of crystal orientation, this depth measured did not change with blasting pressure used.

Surface atoms on wafer were easier to be displaced compared to subsurface atoms, regardless of surface crystal orientation, due to the dangling bonds present on the surface. Subsurface atoms that were completely bonded would require higher displacement energy. OISFs were formed at the damaged sites on the surface of sand blasted wafer. According to results obtained, there was only one layer of OISF formed because no increase in OISF density was observed when wafers were further etched.

When wafers were blasted with different blasting pressure, OISF density generally increases with blasting pressure. A significant difference in OISF density was observed between these two types of crystal orientations. The difference in OISF density, between (100) and (111) wafers, was affected by the blasting pressure used to create damaged sites.

(111) wafer has higher surface atomic packing therefore energy required to displace surface atom was much higher than that of (100) wafer therefore more damaged sites were created on (100) wafer as a result of more surface atom displacement. When blasting pressure increased, the amount of surface atom displaced also increased for both types of wafers and OISF density for (100) wafer was still higher than OISF density of (111) wafer.

Lower surface atom packing density on (100) wafer would have less surface atom compared to the surface of (111) wafer of the same surface area. When blasting pressure was increased further, OISF density of (100) wafer would saturate because all displaceable surface atoms were fully displaced. Under this condition, (111) wafer's OISF density would still be increasing due to the availability of substantial amount of displaceable surface atom on (111) surface. Eventually OISF density of (111) wafer would be higher than the saturated density of (100) wafer.