CHAPTER FIVE

CONCLUSION

Due to the stringent customer requirements for tighter flatness specification, the silicon manufacturing industry faces the challenges to improve the flatness capability of their processes without deteriorating the existing quality of the wafer and yields and incurring additional costs by introducing new processes. The concave etcher was developed for such a purpose to produce incoming feed to polishing to have better flatness compared to the convex etcher.

Although flatness of wafers is more influenced by the polishing condition, the incoming wafer does play a major part in flatness improvement. For the convex etcher, the thickness distribution of the etched wafers varies more than from the concave etcher as shown in Chapter Four because of the dome shape of the convex etched wafer. Due to this thickness variation, during polishing the removal gradient will be more than the concave etcher as shown in Figure 4.1. Figure 5.1 shows the table of flatness yield for STIR at 0.5μm and TTV at 2.5μm. From the table, is clearly evident that for 100mm, the concave etching gives yield improvement as much as 18.9% for STIR and 21% for TTV compared to the concave etcher. For 125mm, the improvement of 13.5% in STIR and 7% in TTV is expected using the concave etcher.

Further test to evaluate if there are any quality issues arising for the different type of etcher used was test performed are using the conventional tool used for characterization of polished silicon wafers in the silicon manufacturing industry. Measurement for LPD

and Haze using CR80 for both diameters did not show any sign of contamination or roughness arising from these processes. Sub-surface damages was measured using OSDA to determine whether the depth of damages is removed by polishing. Results indicate that the current polishing removal is sufficient and shows no deteriotion on sub surface damages within 5μm depth of wafer surface between concave and convex etcher. Lifetime measurement for the recombination of minority carriers was performed to determine whether the surface morphology form both the etchers will influence the carriers lifetime. The test results indicates no such deviation between the lifetime recombination and within the internal specification (>200μs).

It can be concluded that the quality of the wafer is equal or comparable when the concave etcher is used to substitute for the convex etcher and is still within the internal (manufacturer's) specifications. However, yield is expected to improve using the concave etcher and for a large silicon manufacturing company, this is a bonus in cutting the losses for tight flatness orders.

		Yield %		
		Convex Etched	Concave Etched	Improvement
100mm	STIR at 0.5 micron	46.3	65.2	18.9
	TTV at 2.5 micron	60	81	21
125mm	STIR at 0.5 micron	73	86.5	13.5
	TTV at 2.5 micron	74	81	7

Figure 5.The yield improvement gain between Concave and Convex etched polish wafers

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