Lapping and Polishing Si Die to Optical Polish Quality

1.0: Purpose

Polishing of silicon has been a common application for semiconductor materials since the beginning of the integrated circuit. The primary aim of this report is to demonstrate the capability of the Model 920 for preparing the backsides of silicon wafers. Development of a polishing protocol using a Model 920 Lapping and Polishing Machine, a Model 150 Lapping and Polishing Fixture coupled with various consumables will be done to prepare some small silicon die. Polishing of the backside to a specular finish will be done to allow for further processing techniques to be applied.

2.0: Experiments

Several different Si wafer pieces were obtained for polishing. The wafer pieces were cleaved into 5 mm x 10 mm rectangles and were mounted onto a Model 150 Lapping Fixture using a low melting point wax (MWH 135) after being heated on the hot plate. The samples were affixed to the mounting block and then measured prior to lapping and polishing. The samples were mounted onto the Model 920 and held into place on the lapping machine using the Model 92002 Workstation.

Samples were then lapped and polished to a specular finish using the arrangement described above. Below is a description of the process used.

Abrasive	Surface	Wheel Speed	Load	Time
14 micron BC slurry	Cast Fe lapping plate	75 rpm	50 grams	8 minutes
9 micron diamond paste	ShaneyPol Medium polishing cloth	60 rpm	150 grams	15 minutes
3 micron diamond paste	Cotton Fine polishing cloth	60 rpm	150 grams	10 minutes
1 micron diamon slurry	MultiTex polishing cloth	60 rpm	150 grams	10 minutes

During the polishing steps (9 micron through 1 micron) the polishing cloth surface was lubricated using a red polishing fluid (LRE-032) used to enhance the polishing action and to prevent heating during processing. Reducing the specimen thickness was done using the 14 micron lapping step and proved to be a very efficient method of material removal.

3.0: Results

Following processing of the samples they were investigated optically to check for surface scratches and specimen quality. Below are two images of the final polished samples. On the left is the silicon sample following final polishing as mounted on the specimen mounting block. The sample is immersed in mounting wax and the surface is well polished. The image on the right shows an optical light micrograph (OLM) image of the final silicon surface following polishing. The image shows a smooth surface with very little remaining scratches. Some of the darker material on the image is due to a dirty lens.

SBT SOUTH BAY TECHNOLOGY INC.
1120 Via Callejon ■ San Clemente ■ California ■ 92672
Telephone [714] 492-2600 ■ FAX [714] 492-1499 ■ Telex 311882

Figure 1: Illustration of the final polished surface of the silicon samples following processing. On the left is the specimen as mounted on the fixture stub and the right shows an OLM image of the surface after processing.

4.0: Conclusion

It has been shown that successful surface polishing of silicon materials can be achieved in a relatively short amount of time. Multiple samples can be produced using this equipment and can further reduce the processing time for each sample by carefully selecting the proper consumables and process parameters.

SBT SOUTH BAY TECHNOLOGY INC.
1120 Via Callejon ■ San Clemente ■ California ■ 92672
Telephone [714] 492-2600 ■ FAX [714] 492-1499 ■ Telex 311882