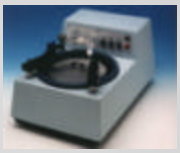


Polishing Protocol for Glass Cover Slides

1.0: Purpose

To characterize and develop a polishing protocol used for polishing glass cover slips. The glass cover slips to be polished are 25 mm wide x 60 mm long x 150 microns thick and are polished in a quantity bundle of about 50. The protocol should incorporate the existing polishing jig, provide an alternative method for polishing at low cost, and be reproducible with high quality, optically polished slides without any evidence of edge chipping or surface roughness.

2.0: Experiments and Procedures

There are several different aspects to this experiment which are an integral part of the results developed. The fixture used was a customer developed fixture designed specifically for holding the glass cover slips with the cross section profile of the end of the slips exposed to the abrasive media. Below is a diagram of what the cover slip dimension is and the appearance following standard polishing techniques (Figure 1).

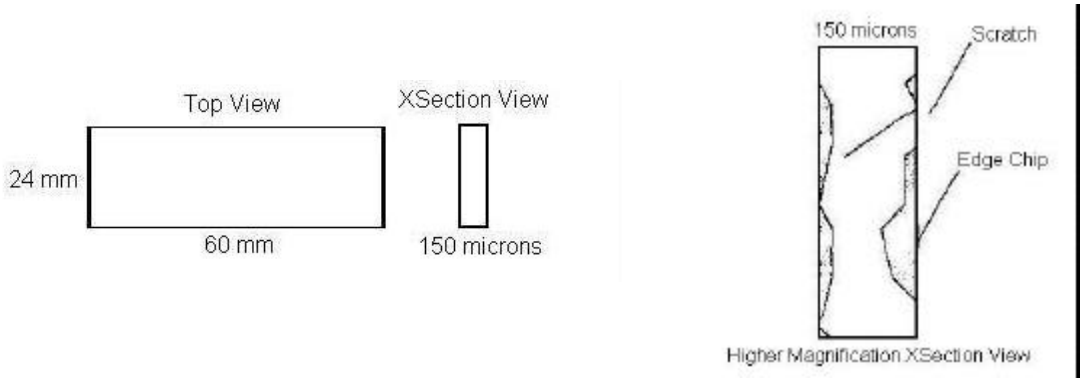


Figure 1: Illustration of the glass cover slip dimensions and the state of the cover slips following polishing using the customer polishing protocol. The new protocol will attempt to remove the edge chipping and scratches observed on the original samples.

The fixture which was used for the polishing process was, as stated earlier, a customer developed fixture which consisted of an aluminum clamping jig placed inside a hollow brass ring. The clamping jig contained a square machined hole down the center designed to allow the glass cover slips to sit between the jig pieces. Once the slips had been properly placed into the jig, they were tightened into place using set screws. The brass ring provides both support and wear resistance to the fixture and allows planar surfaces to be produced. Below are two diagrams of the fixture, a front view (Figure 2A) and bottom view (Figure 2B).

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

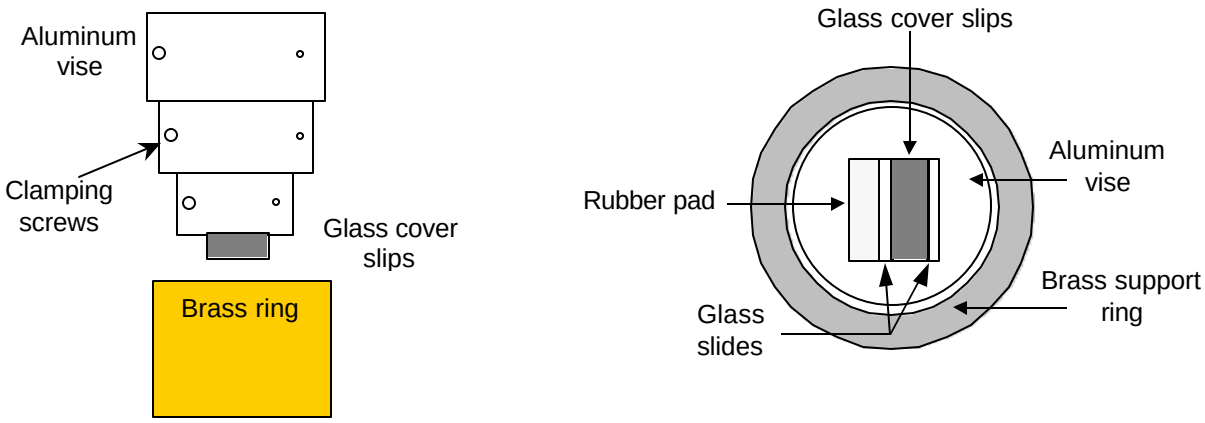
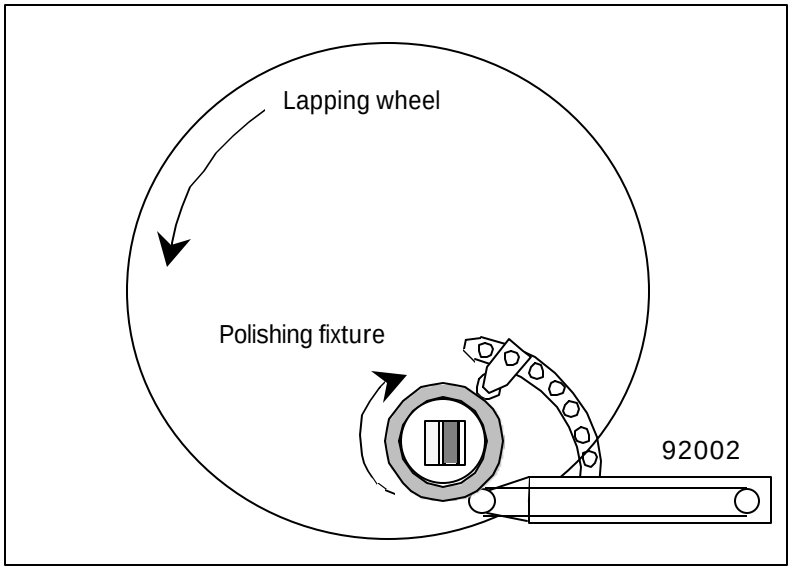


Figure 2: Illustration of the fixture used for lapping and polishing of the glass cover slips. Shown in A) Front view of the fixture and in B) Bottom view of the fixture. The glass cover slips are sandwiched between the glass slides and a rubber pad cushions them when they are tightened.

The fixture was placed onto the Model 920 Lapping and Polishing machine and was held into place using two different methods. The first set of samples was run using the Manual Specimen Yoke fixture (part number 02-02260). The specimen lapping fixture is held into place on the polishing wheel with a stationary Y-shaped holder with two guide wheels at the ends. Rotation of the fixture is carried out by friction of the fixture in contact with the polishing surface (in this case lapping films). The other method used is similar except the Model 92002 Workstation was used. The Model 92002 works the same as the Manual Specimen Yoke except that it rotates the sample mounting fixture with a motor driven post on the Model 920. In this case the speed of the rotation can be adjusted as well as the lapping wheel speed. Below is a diagram of the setup used for the Model 92002 method. The Manual Specimen Yoke is similar in shape and does not have the motor driven option.



Polishing Procedures

Several different abrasive types were used to characterize the best polishing protocol for these glass cover slips based on the amount and severity of scratches and edge chipping which is the main source of problems for this application. Each different process will be discussed below as well as the varied processes used.

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

Silicon Carbide

Silicon Carbide papers and lapping films were first used on the samples to see how successful the polishing process would be on the glass cover slips. The following protocol was used: 400 grit; 500 grit; 15 micron; 9 micron; 3micron. The coarse grits were used for planarizing all of the glass cover slips to the same plane prior to polishing. The sample was held onto the Model 920 using the Manual Specimen Yoke at a lapping wheel speed of 5. The results obtained were close to that of the existing protocol with roughly 40-50% of the glass cover slips exhibiting some sort of chipping or scratching at the edges. The samples were checked both under stereo and inverted microscopes at 10X and 200X magnification, respectively.

Cast Fe Lapping Plate w/ Al_2O_3 Slurry

The next set of samples attempted were used on a cast iron (Fe) lapping plate using a free abrasive, such as Al_2O_3. The samples were held into place in the same fashion as the SiC samples and the cast Fe lapping plate was first conditioned using the conditioning ring and a 22 micron Al_2O_3 slurry. Following the conditioning and resurfacing of the lapping plate, the samples were rough polishing using the same 22 micron slurry. This produced very poor results, with over 90% of the glass cover slips exhibiting either chipping or scratching. This showed that free abrasive lapping is not the method of choice for these samples.

Diamond

Diamond lapping films were the next materials to be tested for preparation of these glass cover slips. The diamond lapping films are similar to the SiC lapping films except the abrasive is different. For these samples, the following protocol was used: 30 micron; 15 micron; 9 micron; 3 micron; 1 micron; 0.5 micron. With these samples the Model 92002 Workstation was used at a speed of 5 for the workstation and 5 on the lapping wheel. The diamond lapping films produced good results with less than 25% of the glass cover slips containing scratches or edge chipping.

3.0: Conclusion

Based on the qualitative results obtained it is apparent that the diamond lapping film method is the best choice for preparing these glass cover slips. Using a standard protocol commonly used in semiconductor specimen preparation, glass cover slips can be. However, proper fixturing to ensure flat, uniformly polished samples needs to be developed to ensure the optimum results available.

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