

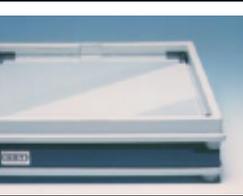
Precision Thickness Dimpling of MgF2 for testing of Ultraviolet properties

Introduction

Magnesium Fluoride (MgF2) has excellent transmission in the UV realm and is used in electro-optics research, development manufacturing. MgF2 is often used to make windows with high transmittance from below 150 nm and extending throughout the visible range. This material is relatively soft and somewhat delicate so polishing and handling are most critical issues. Submitted for precision thickness dimpling are 5mm circular diameter MgF2 windows. The quality of a UV window is extremely critical. It should be of highly polished surface finish in order not to affect the optical system and produce light scattering artifacts. Additionally required are flat edges 0.1 to 0.2 mm around the outer perimeter of the window, which will be used to form a vacuum seal when mated with its glass tubing lamp body. The precise target thicknesses necessary are 200 microns, 80 microns and 20 microns.

Materials

The following equipment and consumable items were used for the preparation:

Equipment		Description
Model D500i Dimpler: with 3i Dimple tool, 4iT dimple polish tool		The D500i is a precision electro-mechanical lapping and polishing instrument. With the ability to continuously monitor and control dimpling parameters. The only system existing in today's market to offer features such as electronic damping, measuring, force, fine balance adjustments.
Quickstick 135 mounting wax		This high hardness and acetone solubility make this wax the ideal choice for abrasive suspension lapping & polishing
6um, 3um, 1um, 0.25um, 0.1um MicroDi diamond suspension.		Permanent polycrystalline diamond suspension offering best finish and polishing times versus alum oxides.
Model 145- Lapping Fixture Model 180- Lapping Tray		The Model 145 is a small versatile hand lapping fixture for sample up to .5" diameter, used in conjunction with the Model 180 stackable lapping tray for securing abrasive paper or films onto a 12" flat glass square. The area under the glass plate serves as a reservoir to contain polishing fluids if used.
0.5 um Diamond abrasive film		Used to give window samples flat edge with good finish w/o compromising hand-polishing time.

Method

1. MgF2 windows with ID#'s 1, 2, 3, 4 were individually mounted onto a sapphire flat using Quickstick 135 mounting wax. The flat and window are mounted into the specimen platen assembly and ready to start the dimpling process.

- All samples were processed using the D500i Dimpler instrument. Detailed in the table below is the basic process:

Step	Dimple Tool	Abrasive	Time (approx)	Comments
1	3i dimple tool	6um MicroDi	55 minutes	Remove stock material
2	3i dimple tool	3um MicroDi	15-20 minutes	Removal of 6um scratches
3	3i dimple tool	1um MicroDi	5 –10minutes	Removal of 3um scratches
4	4iT dimple polish tool	1um MicroDi	30-60 minutes	For near optical finish
5	4iT dimple polish tool	0.25 MicroDi	5-10 minutes	Optical finish
6	4iT dimple polish tool	0.10 MicroDi	5-10 minutes	Optical finish

- In order to achieve a flat edge around the perimeter of the window all samples were mounted onto the Model 145 Lapping Fixture. Hand lapping using the Model 180 lapping tray and 0.5um Diamond film allow efficient processing in under 5 minutes time.

Results

Three of the 12 sample windows were polished to the determined thickness. Window ID 3 fell victim to process made changes in order to increase process time. Eight samples, window ID's 5-12, remain for further processing contingent upon final test results from window supplier. Then process can be finalized or modified to fit accordingly.

Window ID	Status	Thickness	Comments
1	Good	200um	
2	Good	80um	
3	To Thin	-0-	
4	Good	20um	

Conclusion

The D500i Dimpler instrument allowed the Magnesium Fluoride UV windows to be process to thick nesses with optical quality surface finishes. Final testing is to be complete by supplier in order for South Bay Technology to finalize process parameters and achieve a material processing solution in the near future.