Design Project Requirements Review

Global Effect of Mirror Mounted on Aluminum with Adhesive

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Goal:

This project is being done to look at the effect of adhesives on a mirror bound to an aluminum plate.

Materials:

Three different adhesives will be used:

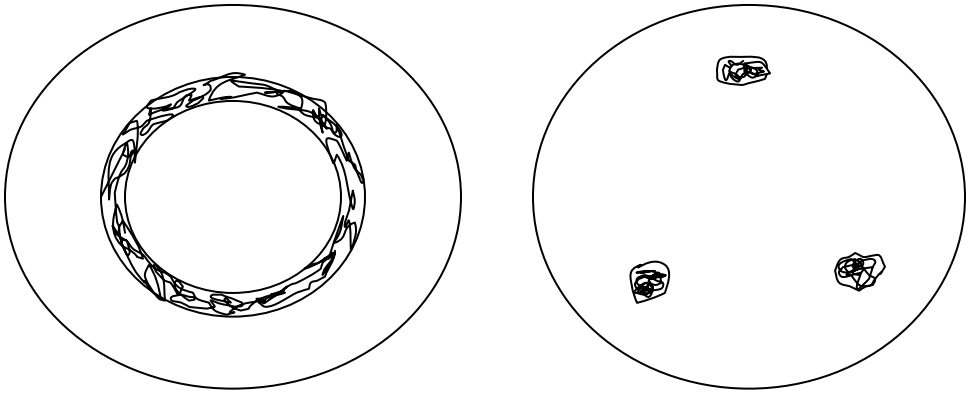
- GE RTV 157
- 3M 2216 Epoxy
- Loctite 326

The mirror substrates have not been chosen yet, that will be decided from material selection with Professor Parks.

Aluminum 6061 will be used as the substrate, pending any change about material availability from Professor Parks.

Design:

Two different configurations will be used:

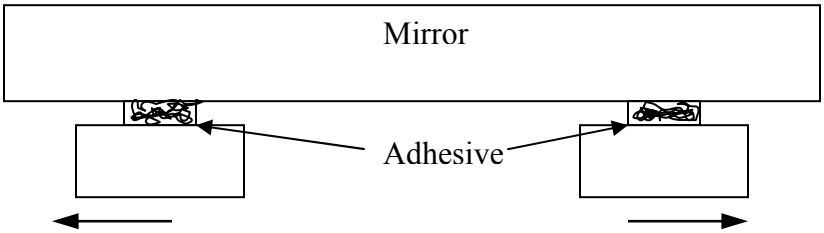


Analysis:

I will perform FEA of the different materials and configurations using COSMOSworks in Solidworks software. Actual testing will also be done by placing samples in a heating chamber that will be tested with an interferometer.

The stress distribution for the ring can be found from Roark's Formulas for Stress and Strain, so this will give another piece of information to compare with the analysis and experimental results.

My FEA will be done by modeling the thermal change with a radial displacement of the aluminum material to simulate the differential expansion of the aluminum compared with the mirror substrate.



Testing

From 3M 2216 data sheet: recommended thickness is 0.005" = 127microns
From Loctite 326 data sheet: recommended thickness is 0.1mm = 100microns
From GE RTV 157 data sheet: maximum thickness is 6mm.

Given a thickness of 100microns, area of 25mm^2, the required volume is 2.5uL.

To complete testing I will use a micrometer syringe that is capable of dispensing accuracy of 0.2 uL.

Current Status

For Glass - **Glass not been selected or purchased**, possible candidates:
From Surplus Shed:

- Square 50x50x3mm, ground and polished Pyrex, $5 (http://www.surplusshed.com/pages/item/pm1203.html)
- 36mm Dia, 2mm thick, AR coated optical white glass, $3 (http://www.surplusshed.com/pages/item/l10024.html)
- 52mm Dia, 2mm thick, AR coated optical white glass, $4 (http://www.surplusshed.com/pages/item/l10022.html)

From Anchor Optics:

Stock #	Size (mm)	Thickness (mm)	Grade	Comments	Price
AX32406	46 DIA.	1.5	-	-	$7.50
AX20403	47 x 138	8	-	-	$8.00
AX27066	48 DIA.	5	-	-	$8.00
AX38360	48 DIA	2.3	1	-	$8.00
AX28179	49	3	-	-	$8.00
AX27070	50.5 DIA.	4	-	CTD.	$8.00
AX27618	50.5 x 76.2	5	-	-	$7.00
AX30974	51 x 63	1.5	-	-	$7.00
AX53677	52 DIA.	1.5	-	-	$7.00
AX28170	52 x 52	3.2	-	OCTAGONAL	$7.00
AX28180	53 x 110	2.3	-	CONVEX	$7.00
AX20439	54 DIA.	2.1	-	-	$7.00
AX2069	54 x 75	3	-	-	$7.50
AX20485	56 DIA.	1	-	-	$7.50
AX27216	56 DIA.	8	-	-	$7.50
AX31031	58 x 69	1.4	-	-	$7.00
AX28036	59 DIA.	1.8	-	-	$7.00
AX27525	60 x 136	3.1	-	-	$7.50
AX20425	60 DIA.	6.4	-	-	$7.00
AX20489	62 DIA.	2.8	-	-	$7.00
AX27076	62 DIA	2	-	-	$7.00
AX32555	63 DIA.	1	-	-	$7.50
AX27526	63.5 DIA	3	-	-	$7.00

For adhesives:
All 3 adhesives are currently in Professor Park's lab.

For aluminum substrates:
Tianquan ordered stock aluminum blocks 2"x 2"x 0.5" and we will prepare the surface ourselves to save cost.

ISO Standards

ISO 15605:2000 - Adhesives -- Sampling
ISO 17212:2004 - Structural adhesives -- Guidelines for the surface preparation of metals and plastics prior to adhesive bonding

These ISO standards could be helpful, but were not included on the ISO Stds CD given by Professor Parks.

Future Tasks

- Start FEA of adhesive
- Continue practicing application of adhesives
- Develop formal processes for application of adhesives