CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2007
DateRun:	09/16/2007
Experimenters:	Jason Marshall
ClientType:	Optical Manufacturer
ProjectNumber:	Project #1
Substrates:	Glass/Quartz
PartType:	Part
Contaminants:	
Cleaning Methods:	Immersion/Soak
Analytical Methods:	Gravimetric
Purpose:	To evaluate supplied parts for resistance to alkaline solution.

Experimental Procedure:

Glass samples were delivered polished to the specified polishing conditions. Each glass sample was weighed using a analytical balance. One sample of each glass type were hung by platinum wire into 0.01 mol/liter sodium hydroxide at 50 deg C for the length of times specified (15 minutes, 1 hour, 4 hours or 16 hours). After this treatment, the samples were weighed again and the loss of the mass of the sample were calculated. Calculation of the time t0.1 in hours, necessary to etch a surface layer a depth of 0.1 um was done using the following formula:

t0.1 = (tedS)/[(m1-m2)*100]
where:
t0.1 = the time (min) necessary to etch a surface layer to a depth of 0.1 m
te = the time (min) for attach in the experiment
d = the specific gravity of the sample
S = the surface area (cm2) of the sample
m1 = the mass (mg) of the sample before the test
m2 = the mass (mg) of the sample after the test

Phosphate Resistance Class PR 1 2 3 4
Time t0.1 needed to etch to a depth of 0.1um/min >240 240~60 60~15 <15

In addition, changes in the surface of the sample following the treatment are qualitatively evaluated with the naked eye. Additional classification numbers are given according to the second table.

Additional Number Changes in the Surface
.0 No visible changes
.1 Clear, but irregular surface (wavy, pockmarked)
.2 Interference colors (slight selective leaching)
.3 Tenacious thin whitish layer (stronger selective)
.4 Loosely adhering thick layer (surface crust)

Results:

The target weight loss of 0.0010 grams (1 mg) was reached by two of the eight glass pieces (Sample A and Sample 1) after soaking for 16 hours. Samples 2 and B both were close to the 0.0010-gram level but did not exceed the value. The tables list the amount of weight loss after each time interval.

0.25 hour

sample id	m1	m2	m1-m2
A	3.806	3.8058	0.0002
B	3.8679	3.8679	0.0000
C	3.8306	3.8305	0.0001
D	4.1472	4.1472	0.0000
1	6.4285	6.4286	-0.0001
2	1.2379	1.2379	0.0000
3	1.2177	1.2177	0.0000
4	1.2546	1.2543	0.0003
1 hour			
sample id	m1	m2	m1-m2
A	3.806	3.8058	0.0002
B	3.8679	3.8675	0.0004
C	3.8306	3.8303	0.0003
D	4.1472	4.1467	0.0005
1	6.4285	6.4286	-0.0001

CLEANING LABORATORY EVALUATION SUMMARY

2	1.2379	1.2374	0.0005
3	1.2177	1.2177	0.0000
4	1.2546	1.2543	0.0003
4 hour			
sample id	m1	m2	m1-m2
A	3.806	3.8054	0.0006
B	3.8679	3.8671	0.0008
C	3.8306	3.8303	0.0003
D	4.1472	4.1464	0.0008
1	6.4285	6.4278	0.0007
2	1.2379	1.2372	0.0007
3	1.2177	1.2177	0.0000
4	1.2546	1.2543	0.0003

.

Sample ID	density(d)	surface area(s)	d*S	time (te)	te*d*S	te*d*S/ [(m1-m2)*100]
A	3.22	45.66	147.032	16	2352.506	23525.0624
1	2.23	53.9	120.197	16	1923.152	16026.2667

.

Sample ID	Level
A	AR1.0
B	AR1.0
C	AR1.0
D	AR1.0
1	AR1.0
2	AR1.0
3	AR1.0
4	AR1.0

Summary:

Conclusion: Six samples did not exceed the 1 mg weight loss. However, all eight samples would be classified as AR1.0 as the two samples that did loose over the 1 mg did so only after 16 hours of soaking. None of the samples had any visible abnormalities.