CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	1999
DateRun:	08/15/1999
Experimenters:	Jason Marshall, Nicole Vayo
ClientType:	Consultant
ProjectNumber:	Project #1
Substrates:	Ceramics, Alumina
PartType:	Coupon
Contaminants:	Alcohol
Cleaning Methods:	Immersion/Soak
Analytical Methods:	Black light, Gravimetric, Visual
Purpose:	To further evaluate the effectiveness of the two best cleaners using a thicker Evanol solution.

Experimental Procedure:

Two cleaning solutions and DI Water were selected for testing based on their performance from the previous trials. Two sets of the cleaning solutions were made into two percent solutions using DI water in 600 mL beakers. One set was evaluated at room temperature and the other set was heated to 130 F on a hot plate. Table 1 lists the cleaning solutions used.

Thirty coupons were wiped with Isopropyl Alcohol and air dried. The coupons were weighed to establish a baseline level of cleanliness. All 30 coupons were observed for particulate matter using an UVP Inc. Black light, Model UVL-56 longwave UV-366nm. The coupons were dipped into the Evanol and dried for 35 minutes in an oven at ~80 C. Five coupons were cleaned in each solution for five minutes using stir-bar agitation. Parts were rinsed for two minutes in DI water also with stir-bar agitation. The group cleaned at room temperature were rinsed in DI water at room temperature and the heated cleaning was rinsed with heated DI water at the same temperature.

The parts were dried in a convection oven at 212 F for 15 minutes. After allowing parts to cool to room temperature, final weights were recorded. All coupons were observed again under black light for particulate matter and any remaining Evanol. Visual observations were made on all the coupons for any visible signs of contamination.

SUBSTRATE MATERIAL: Ceramic-Alumina coupons
CONTAMINANTS: DuPont Evanol Concentrated (Vinyl Alcohol Polymers & Copolymers CAS#s: 9002-89-5, 25213-24-5, 54626-91-4; Methanol Bulk/Packaged CAS #: 67-56-1; Sodium Acetate CAS#: 127-09-3)
CONTAMINATING PROCESS USED: Dip coupons into contaminant solution and dry using convection oven between 75-90 C for 35 minutes.

Results:

All three solutions were effective in removing the concentrated Evanol off of the coupons at 130 F. There was some difficulty in cleaning at room temperature. The lower temperature cleaning left visible amounts of Evanol on all of the coupons. At the elevated temperature there were only a handful of coupons with any contaminant remaining. Micro 90 performed the best at both temperatures. Table 1 lists the calculated efficiencies and Table 2 list the observations made for both black light and visual methods.

Table 2. Cleaning Efficiencies

Cleaner	Micro 90	Inproclean	DI Water	Micro 90	Inproclean	DI Water
Coupon 1	82.32	77.43	79.83	99.87	95.36	100.2
Coupon 2	85.3	80.98	81.94	99.89	99.17	99.79
Coupon 3	77.85	66.53	85.08	100	99.49	99.68
Coupon 4	85.02	81.77	73.15	99.91	99.26	100.08
Coupon 5	87.31	81.75	67.3	100.3	97.12	
Coupon 6	86.25					
Average	84.01	77.69	77.46	99.99	98.08	99.94

Observations for Black Light & Visual Analysis

Black Light	Dirty	Cleaned	Non Particulate	Visual
Coupon #	# of Spots	# of Spots	Fluorescence	

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1	3	1		mostly covered & on back
2	0	2		mostly covered & on back
3	2	2	Yes	mostly covered & on back
4	3	0	Yes	some covered
5	5	0	Yes	mostly covered & on back
6	5	4		mostly covered & on back
7	0	0	Yes	mostly covered & on back
8	1	1		mostly covered & on back
9	8	5		mostly covered & on back
10	3	0	Yes	mostly covered & on back
11	2	1		mostly covered & on back
12	3	0	Yes	mostly covered & on back
13	2	3	Yes	mostly covered & on back
14	4	3	Yes	mostly covered & on back
15	0	1	Yes	mostly covered & on back
16	1	3	Yes	mostly covered & on back
17	0	1		on back
18	1	0		little on back
19	6	0	Yes	some on front & back
20	3	1		on back

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21	1	0		on back
22	2	0		some on front & back
23	2	0		some on front & back
24	5	2		on back
25	4	0		on back
26	5	1		some on front & back
27	10	0		on back
28	5	0		on back
29	2	1		on back
30	5	0		some on front & back

All three methods proved that the cleaning solutions were more effective at the higher temperatures

Summary:

Substrates:	Ceramics, Alumina
Contaminants:	Alcohol

Company Name:	Product Name:	Conc.:	Efficiency:	Effective:	Observations:
Oakite Products	Inproclean 3800	2	98.08	☑	
Oakite Products	Inproclean 3800	2	77.69	☐	
International Products Corporation	Micro 90 Conc.	2	99.99	☑	
International Products Corporation	Micro 90 Conc.	2	84.01	☐	
Water	DI Water	100	99.94	☑	
Water	DI Water	100	77.46	☐	

Conclusion:

Micro 90 was the most effective cleaner tested on the concentrated Evanol. All three solutions did remove over 98% of the contaminant at 130 F.