CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	1999
DateRun:	08/30/1999
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, Colorimeter, Gravimetric
Purpose:	To evaluate cleaning at different levels of contamination.

Experimental Procedure:

One cleaning solutions and DI Water were selected for testing based on their performance from the previous trials. A 2% solution was made of the cleaner using DI water in 600 mL beakers. three concentrations of the contaminant were added to different beakers of the cleaner and DI water, based on volume percent (5, 10 and 15). Each were heated to 100 F on a hot plate. 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 overnight at room temperature. 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. Rinsing was performed for two minutes 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.
Samples were measured for chlorine concentration using LaMotte's Smart Colorimeter. Readings were made before and after cleaning.

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 overnight at room temperature

Results:

Micro 90 was successful in removing nearly all of the contamination from the coupons at all three levels of soil loading. At 15% Evanol concentration, the Micro 90 removed approximately 97% of the Evanol on the coupons. The DI water was not as effective at the higher soil loading, cleaning nearly 91% of the contaminant.
Black light fluorescence was inconclusive for the coupons cleaned with the Micro 90. For the DI samples, many fluoresced excessively, revealing that there was still contamination present in larger amounts. Visual inspection was showed that most of the coupons had some of the contaminant still on them. Table 1 lists efficiencies for each coupon and the visual observations at each level of soil loading.

Table 1. Effectiveness of Cleaning

Cleaner	Evanol	Contaminant Location	Evanol	Contaminant Location	Evanol	Contaminant Location
Micro 90	5%		10%		15%	
	98.68	lower section	99.77		96.8	on corner
	96.16	lower section	97.65	lower section	99.83	
	100		99.04	lower section	92.16	on corner
	98.9	upper section	99.53	on corner	98.87	across middle
	99.66	some on back	98.82	on corner	97.72	
Average	98.68		98.96		97.08	
Cleaner	Evanol	Contaminant	Evanol	Contaminant	Evanol	Contaminant
DI Water	5%	Location	10%	Location	15%	Location

CLEANING LABORATORY EVALUATION SUMMARY

	99.83	lower section	96.48	on corner	92.41	side & middle
	99.43	on corner	96.82	on corner	82.07	all over
	93.15	on corner	89.37	lower section	87.39	all over
	97.47	lower section	98.76	on corner	94.49	all over
	97.65	on corner	97.16	side	98.24	
Average	97.51		95.72		90.92	

Using the colorimeter data, formulas were calculated for each cleaning solution based on baseline readings made from the three levels of soil loading. From the graphs, the readings made after cleaning were measured and approximate soil loading percents were determined. Tables 2 and 3 list the values used for determining the relationships between soil loading and chlorine levels. Figures 1 and 2 can be used to find the unknown soil loading levels.

Table 2. Micro 90 Colorimeter Data

Baseline	After Cleaning	Soil Loading		
Standard Reading	Calculated	Readings	Vol% from graph	
0	0	0.005		
5	0.05	0.04	0.05	6.5
10	0.07	0.075	0.1	13.5
15	0.11	0.11	0.14	19
25	0.18			
Slope	0.007	y-int	0.005	r = 0.9879

Table 3. DI Water Colorimeter Data

Baseline	After Cleaning	Soil Loading		
Standard Reading	Calculated	Readings	Vol% from graph	
0	0	0.006	0	0
5	0.06	0.052	0.07	7
10	0.1	0.098	0.12	12.5
15	0.14	0.144	0.17	18
20	0.19			
slope	0.0092	y-int	0.006	r = 0.99438

Summary:

Substrates:	Ceramics, Alumina				
Contaminants:	Alcohol				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
International Products Corporation	Micro 90 Conc.	2	98.68	☑	5% evanol
International Products Corporation	Micro 90 Conc.	2	98.96	☑	10% evanol
International Products Corporation	Micro 90 Conc.	2	97.08	☑	15% evanol
Water	DI Water	100	97.51	☑	5% evanol
Water	DI Water	100	95.72	☑	10% evanol
Water	DI Water	100	90.92	☐	15% evanol

Conclusion:

Having determined that the Micro 90 was still very effective in removing a majority of the contamination at the 15% soil loading, additional testing could be performed at higher levels of soil loading (25-50%).