CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	1999
DateRun:	07/28/1999
Experimenters:	Jason Marshall, Nicole Vayo
ClientType:	Microelectronics Mfr
ProjectNumber:	Project #1
Substrates:	Aluminum
PartType:	Coupon
Contaminants:	Fluxes, Resins/Rosins
Cleaning Methods:	Immersion/Soak
Analytical Methods:	Gravimetric
Purpose:	To determine if previous tested cleaners could work at lower dilutions using immersion or ultrasonic cleaning.

Experimental Procedure:

Two aqueous cleaners previously tested were made into 10% solutions using DI water in a 600 ml Pyrex beakers. The semi-aqueous cleaner was made into 10, 20 and 50% solutions also in beakers using DI water. Preweighed coupons were coated with the negative photoresist and weighed again. Three coupons were placed into the 20 and 50% solutions and cleaned using stir-bar-agitation. Observations were made at 10 and 30 minutes. At the end of the 30 minutes, the coupons were rinsed with a tap water bath at 120 F for one minute and air dried for two hours. The coupons were weighed again and the efficiencies calculated.

All cleaning solutions and dilutions were used to clean coupons using a Crest 40 kHz ultrasonic tank model 4Ht 1014-6. Observations were made at 5, 10, 15 and 20 minutes. At the end of the 20 minutes, coupons were rinsed in a tap water spray for one minute at 120 oF. Coupons were dried at room temperature for two hours. After drying coupons were weighed and efficiencies were calculated. In addition to the ultrasonic cleaning, one coupon was immersed in each solution and allowed to soak overnight at room temperature with no agitation. Coupons were rinsed in tap water spray for one minute at 120 F and dried at room temperature. Gravimetric analysis was performed to determine the effectiveness of the cleaning.

SUBSTRATE MATERIAL: Aluminum coupons (1100-H14)
CONTAMINANTS: Olin HNR 120 Negative Photoresist (CAS#s: 1330-20-7 [65-70%]; 100-41-4 [15-18%]; 68441-13-4 [9-15%]; 5284-79-7 [0.1-0.6%])

Results:

The immersion cleaning using the two concentrations of Bio-T Max proved unsuccessful after 30 minutes. Table 2 lists the efficiencies and the observations made at ten and 30 minutes.

Table 2. Immersion Cleaning 30 Min

Cleaner	Bio-T	Bio-T
Conc Used	20%	50%
Coupon 1	5.08	5.87
Coupon 2	5.36	9.03
Coupon 3	4.66	9.28
Average	5.03	8.06
Obs @ 10 min	some dissolving	good dissolving
Obs @ 30 min	could wipe off	could wipe off

The use of the ultrasonic energy did increase the effectiveness of the cleaning solutions. The 50% solution of Bio-T Max was mostly clean after 20 minutes. Table 3 lists the results of the gravimetric analysis and lists the observations after each five minute interval.

Table 3. Ultrasonic Cleaning 20 Min

Cleaner	Bio-T	Bio-T	Bio-T	FO	GT
Conc	10%	20%	50%	10%	10%
Coupon 1	28.83	29.67	78.85	7.89	12.01
Coupon 2	25.28	29.75	96.75	8.04	16.63
Coupon 3	32.37	23.04	69.78	9.99	11.1
Average	28.83	27.48	81.79	8.64	13.24
Obs @ 5	not good	could peel off	could wipe off	No cleaning	No cleaning

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Obs @ 10	spotty removal	spotty removal	became mushy	Little cleaning	Some dissolving
Obs @ 15	more spot removal	more spot removal	easily removed	could peel off	More dissolving
Obs @ 20	could peel off	more spot removal	almost clean	no dissolving	could peel off

The fourth table lists the calculated efficiencies after the coupons soaked overnight at room temperature with no agitation. Both the Bio-T Max 20 and 50% solutions were very effective in removing the contaminant
from the coupons.

Table 4. Overnight Soak Results

GT	FO	BT-10%	BT-20%	BT-50%
10.7	5.36	38.64	87.57	98.02

Summary:

Substrates:	Aluminum				
Contaminants:	Fluxes, Resins/Rosins				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Bio Chem Systems	Bio T Max	10	38.64	☐	
Bio Chem Systems	Bio T Max	20	87.57	☑	
Bio Chem Systems	Bio T Max	50	98.02	☑	
Fine Organic Corporation	FO 2085 M	10	5.36	☐	
Gemtek Products	SC Aircraft & Metal Cleaner Super Concentrate	10	10.70	☐	

Conclusion:

The removal of the negative photoresist was effectively removed by diluted solutions of Bio-T Max. Using Bio-T Max at 50% dilution and ultrasonic energy resulted in ~80% removal after 20 minutes. The same dilution was ~98% effective after soaking for 24 hours. A 20% dilution of Bio-T Max removed ~88% of the contaminant also after soaking for one day.