

# CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 1995

DateRun: 08/01/1995

Experimenters: Donald Garlotta, Jay Jankauskas

ClientType: Electro-Optical Devices

ProjectNumber: Project #1

Substrates: Glass/Quartz

PartType: Coupon

Contaminants: Waxes

Cleaning Methods: Ultrasonics

Analytical Methods: Gravimetric, Visual, Waterbreak

Purpose: Determine the effectiveness of ultrasonics

Experimental Procedure: Cleaning was done in beaker ultrasonics set at 150 F. Cleaning time will be determined during the trial depending on the cleaner's effectiveness. Two glass samples will be used for each cleaner. The samples will be rinsed in a tap water bath for 1 minute at 150 F and then in a DI water rinse for 1 minute at room temperature. The parts will then be dried under an air knife for 1 minute and then in a convection oven set at 120 F for 30 minutes. The samples will be analyzed gravimetrically to get a percent removal. The samples will be observed with a water-break test to detect any residual wax. After drying, the samples will be checked for any water spotting that may occur.

Trial #1-  
SAMPLE NUMBERS: #1, #2  
CLEANING PRODUCT: Alconox Alcojet Detergent  
CONCENTRATION: 2% solution (20 grams per liter solution)

Trial #2-  
SAMPLE NUMBERS: #3, #4  
CLEANING PRODUCT: International Products Micro  
CONCENTRATION: 4% by volume

Trial #3-  
SAMPLE NUMBERS: #5, #6  
CLEANING PRODUCT: Oakite Inproclean #3800  
CONCENTRATION: 10% by volume

Trial #4-  
SAMPLE NUMBERS: #7, #8  
CLEANING PRODUCT: Innovative Organics L-12 cleaner  
CONCENTRATION: 10% by volume

Results: After cooling down, all the cleaners were ranked in three categories: Wax Removal, Wax Separation and Spotting. A number of one to four was assigned for each cleaner's performance, one being the best performer and four being the worst.

|                  | Percent Removal | Wax Separation | Spotting |
|------------------|-----------------|----------------|----------|
| Alcojet          | 1               | 2              | 1        |
| Micro            | 3               | 1              | 3        |
| Inproclean #3800 | 2               | 2              | 1        |
| L-12             | 4               | 4              | 4        |

The Innovative Organics L-12 cleaner also had the problem of redeposition during the trial. The wax would be removed and float up on the surface, after a while, the glob of wax would sink in the solution and cling to the glass surface again.

## GRAVIMETRIC ANALYSIS

| sample # | clean mass (g) | mass with contamination (g) | mass after cleaning (g) | contaminant removed (g) | Percent Removal |
|----------|----------------|-----------------------------|-------------------------|-------------------------|-----------------|
| 1        | 14.8772        | 17.5155                     | 14.8765                 | 2.639                   | 100.03%         |
| 2        | 16.5516        | 19.2710                     | 16.5513                 | 2.7197                  | 100.01%         |
| 3        | <b>12.3678</b> | <b>14.6132</b>              | <b>12.3680</b>          | <b>2.2452</b>           | <b>99.99%</b>   |
| 4        | <b>14.3587</b> | <b>16.9307</b>              | <b>14.3591</b>          | <b>2.5716</b>           | <b>99.98%</b>   |

## CLEANING LABORATORY EVALUATION SUMMARY

|   |         |         |         |        |         |
|---|---------|---------|---------|--------|---------|
| 5 | 15.0665 | 18.0461 | 15.0665 | 2.9796 | 100.00% |
| 6 | 13.3553 | 16.2423 | 13.3550 | 2.8873 | 100.01% |
| 7 | 14.0972 | 17.3542 | 14.2524 | 3.1018 | 5.23%   |
| 8 | 15.7449 | 19.4233 | 15.8566 | 3.5667 | 96.96%  |

1,2 - Alconox Alcojet  
3,4 - International Products Group Micro  
5,6 - Oakite Inproclean #3800  
7,8 - Innovative Organics L-12

Summary:

| <b>Substrates:</b>                 | Glass/Quartz                |        |             |                                     |               |
|------------------------------------|-----------------------------|--------|-------------|-------------------------------------|---------------|
| <b>Contaminants:</b>               | Waxes                       |        |             |                                     |               |
| Company Name:                      | Product Name:               | Conc.: | Efficiency: | Effective:                          | Observations: |
| Alconox Inc                        | Alcojet                     | 2      |             | <input checked="" type="checkbox"/> |               |
| International Products Corporation | Micro (no longer available) | 4      |             | <input type="checkbox"/>            |               |
| Oakite Products                    | Inproclean 3800             | 10     |             | <input checked="" type="checkbox"/> |               |
| Innovative Organics Inc            | Amberclean L 12             | 10     |             | <input type="checkbox"/>            |               |

Conclusion:

Immersion: The stir-bar agitation appeared to provide sufficient energy for cleaning. The Alcojet and the Oakite Inproclean #3800 were both very successful in cleaning the glass samples. Brushing should also be considered to ensure cleanliness (International Products Micro cleaner was successful when brushing was applied).

Ultrasonics: The ultrasonics was successful for all cleaners except the Innovative Organics L-12 cleaner. Results suggest that a lower cleaning temperature can be used as opposed to agitated immersion. The ultrasonics also provided a better separation of wax from the cleaner solution.

Rinsing: The rinsing procedures used were successful in removing residual cleaner from the glass and leaving a spot free surface after drying. A final rinse of cold running DI water may be appropriate (some residual cleaning solution was noticed on the samples when rinsed in a still bath of DI water).