CLEANING LABORATORY EVALUATION SUMMARY

SCL #: 2025

DateRun: 12/11/2025

Experimenters: Amelia Wagner

ClientType: Medical Instrument Mfr

ProjectNumber: Project #1

Substrates: Other

PartType: Coupon

Contaminants: Oil

Cleaning Methods:

Analytical Methods: Contact Angle (Surface Tension)

Purpose: To test the efficacy of aqueous cleaners and solvents in removing kerosene oil from phosphor bronze fine mesh in comparison to the current Isopropyl.

Experimental Procedure: Twelve coupons of phosphor bronze mesh were chosen with three coupons assigned to each cleaner being tested. Contact angle (surface tension) measurement method was chosen for cleanliness analysis of the phosphor bronze mesh in order to quantitatively compare cleanliness levels of the mesh prior to and after cleaning. The initial contact angles were recorded for each piece of phosphor bronze mesh by placing a 2 microliter droplet of DI water on the surface of each coupon and measuring the angle of contact between the water droplet and the coupon. To soil the coupons, each coupon was dipped into a beaker of kerosene oil so that the bottom half of each coupon was covered in oil. The coupons were allowed to sit undisturbed for 15 minutes. Contact angle measurements of each coupon were then recorded. The coupons were then subjected to 20 minutes of unheated ultrasonics within their respective cleaners. The coupons cleaned in the AmberClean L12 were then rinsed under the DI water tap for 1 minute each in order to remove any residue left behind from the cleaner. All other coupons were not rinsed. All coupons were allowed to air dry over the course of 3 hours before having their final contact angle measured and recorded.

The equation below was used to determine how closely each coupon was returned to its original state (with 100% meaning a complete return to its original state):

100X(clean angle-dirty angle)/(initial angle-dirty angle)

Results:

Cleaner	Initial Angle	Dirty Angle	Clean Angle	% DET	AVG % DET
AmberClean L12 5%	56	34	36	9.10%	-9.63%
	57	37	35	-10%	
	63	38	31	-28%	
Isopropyl Alcohol	61	33	37	14.29%	35.12%
	56	39	47	47.06%	
	59	34	45	44%	
Acetone	61	39	42	13.64%	13.76%
	67	34	39	15.15%	
	60	36	39	12.50%	
Tert-Butyl Acetate	61	27	41	41.18%	44.77%
	62	33	48	51.72%	
	61	32	44	41.40%	

Negative percentages are likely due to residue of the cleaner being left behind. The amount of residue left was larger than the amount of kerosene oil or was in addition to unremoved kerosene oil resulting in in a negative amount of return to original state (leading to a change in contact angle in the opposite direction to the original angle from the dirty angle.)

Summary:

Substrates:	Other				
Contaminants:	Oil				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Innovative Organics Inc	Amberclean L 12	5%	-9.63	☐	
Fisher Scientific	Isopropanol (CAS:67-63-0)	99%	35.12	☐	
Fisher Scientific	Acetone (CAS: 67-64-1)	99%	13.64	☐	
Lyondell Chemical Company	Tertiary butyl acetate	99%	44.77	☐	

Conclusion: Even with a substantial post cleaning rinse, the aqueous cleaner AmberClean L12 (5%) left a residue that was picked up by the contact angle measurement. A lower concentration or a longer rinse cycle could

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alter these results in future testing. None of the products tested can be considered 'effective', however the Tert-Butyl Acetate was able to perform better than the currently used Isopropyl Alcohol.

Next steps can include extending the cleaning time, lowering the concentration of the AmberClean L12, and testing other Aqueous options.