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A2LA Accredited ISO/IEC 17025:2005 Certificate # 2558.01

855 Electroless Copper Plating Process

The **Accu-Labs 855** electroless copper system is specifically formulated to deposit exceptionally fine grain, low stress copper coverage on high performance substrates.

Accu-Labs 855 has a user friendly window of operation with exceptional stability resulting in favorable maintenance costs.

Accu-Labs 855 features:

- Plates at a temperature range of 110 - 120°F
- Maximum stability resulting in lower maintenance
- Wide window of operation
- Easy to operate, maintain and waste treat
- Deposits 80 - 100 micro-inches of copper in 30 minutes

BATH MAKE-UP (Mix in order with moderate to vigorous air agitation)

- | | |
|---|------------------|
| • DI water | 83.20% by volume |
| • 855-M | 12.0% by volume |
| • 855-A | 3.0% by volume |
| • Liquid Caustic Soda (50% High Purity) | 1.0% by volume |
| • Formaldehyde (37% High Purity) | 0.80% by volume |

Mix thoroughly and raise bath to operating temperature.

BATH COMPONENT PROPERTIES & OPERATING GUIDELINES

Operating Guidelines:

<u>Bath Parameter</u>	<u>Range</u>	<u>Optimum</u>
Copper Metal	1.8-2.2 g/l	2.0 g/l
NaOH	7.0-8.0 g/l	7.5 g/l
HCHO	2.5 – 3.5	3.0 g/l
EDTA	25.0-35.0	30.0 g/l
Temperature	110-120°F	115°F
Bath Loading (Ft ² /gal)	0.50-1.50 Ft ²	1.00 Ft ²
Dwell Time:	30 minutes/100 micro-inches	
Agitation:	Air agitation recommended during use and during idle or dormant periods.	
Filtration:	Constant filtration through 1-10 micron polypropylene cartridge or filter bag at a rate of one bath turnover per hour.	
Ventilation:	Recommended	

MAINTENANCE AND REPLENISHMENT

To ensure proper operation of the **855** system, the solution chemistry should be maintained between 90% and 110% of its initial activity. This is accomplished by measuring and monitoring the copper metal concentration.

Upon determination of the copper concentration, additions are made based on the following replenishment guide for a 100 gallon bath:

% Copper	855-A liters	855-R liters	NaOH	HCHO	Bail-out liters
110%	NONE	NONE	NONE	NONE	NONE
100%	NONE	NONE	NONE	NONE	NONE
90%	1.25	0.625	0.35	0.28	~2.50
80%	2.50	1.250	0.70	0.56	~5.00
70%	3.75	1.875	1.05	0.84	~7.50
60%	5.00	2.500	1.40	1.12	~10.0
Auto Replenish Ratio	1.00	0.50	0.26	0.21	~2.00

NOTE: Always use vigorous agitation when replenishing **855-A** and **855-R**; it is recommended that these two components pass through the filter before entering the bath.

Additional Maintenance Information

During intermittent use or periods of bath dormancy, the NaOH and HCHO concentrations will require independent adjustments. Add approximately 5 mls of 50% high purity sodium hydroxide per gallon of bath (1.3 mls/liter) to raise the NaOH concentration by 1 gram/liter. Add 10 mls of 37% high purity formaldehyde per gallon of bath (2.7 mls/liter) to raise the HCHO concentration by 1 gram/liter.

If the EDTA concentration falls below 30 grams/liter, raise to optimum by adding 15 mls **855-M** per gallon of bath (4 mls/liter) to increase the EDTA concentration by 1 gram/liter.

ANALYTICAL CONTROL

Copper – The copper concentration is best controlled by Atomic Absorption Spectrophotometer; contact your Accu-Labs Representative for assistance.

For Copper control by Wet Analysis:

REAGENTS:

- 20% sulfuric acid (carefully add 200 mls of concentrated sulfuric acid to 600 mls DI water. Allow to cool and dilute to one liter)
- Potassium Iodide (reagent grade)
- 0.100N sodium thiosulfate, standardized
- 10% potassium thiocyanate (dissolve 100 grams KSCN in DI water, dilute to 1L)
- Starch indicator (1%)
- Sulfamic acid (reagent grade)

PROCEDURE:

- Add 20 mls of **855** bath into a 250 ml Erlenmeyer flask
- Add 40 mls of 20% sulfuric acid and 0.5 grams sulfamic acid (gently stir)
- Bring solution to boil for 60 seconds and remove from heat
- Allow to cool for 5 minutes
- Add 2 grams potassium iodide, stir for 3 minutes to completely dissolve
- Titrate with 0.1N sodium thiosulfate to straw color
- Add 20 mls of 10% KSCN and 5 mls of 1% starch indicator
- Continue titrating to the off-white end point

CALCULATION:

Grams/liter of copper = mls titrant x Normality (0.1) x 63.54 / 20 mls
% copper = g/l of copper x 50

Sodium Hydroxide and Formaldehyde

REAGENTS:

- 0.1N hydrochloric acid, standardized
- 1 M sodium sulfite (dissolve 126 grams anhydrous sodium sulfite and dilute to one liter. Adjust pH to 10.0 with dilute NaOH or HCl (discard after 1 month)

PROCEDURE:

- Pipette 5 mls of **855** bath into a 250 ml beaker and add 100 mls DI water
- Using a pH meter (buffered at pH 10.0) titrate to pH of 10.2 with standardized 0.1N HCl. Record volume and use to determine sodium hydroxide concentration
- Adjust pH to 10.0 with 0.1N HCl and add 25 mls of 1 M sodium sulfite
- Stir 5 minutes to complete reaction between sodium sulfite and formaldehyde
- Refill burette and titrate with 0.1N HCl to pH 10.0. Record volume and use to determine formaldehyde concentration

CALCULATION:

Grams/liter NaOH = mls HCl x Normality (0.1) x 40 / 5 mls

Grams/liter HCHO = mls HCl x Normality (0.1) x 30 / 5 mls

EDTA

REAGENTS:

- pH 10.0 ammonium chloride buffer (dissolve 70 grams of ammonium chloride in 400 mls DI water; add ammonium hydroxide to a pH of 10.0 and dilute to 1 liter
- 0.016 M Cu ++ standard (dissolve 4.0 grams of CuSO₄5H₂O in DI water and dilute to one liter. Standardize with primary EDTA titrant.
- 0.1% PAN indicator (dissolve 0.1 grams of 1-(2-pyridylazo)-2-naphthol in 100 ml ethanol

PROCEDURE:

- Pipette 10 mls of **855** bath into 250 ml Erlenmeyer flask and add 75 mls DI water
- Add 20 mls of pH 10.0 buffer and 10-12 drops of 0.1% PAN indicator
- Titrate with 0.016 M Cu⁺⁺ standard to violet end point

CALCULATION:

Complexed EDTA g/l = 6.55 x copper content (g/l)

Free EDTA g/l = mls Cu⁺⁺ x Molarity (0.016) x 416 / 10 mls

Total EDTA g/l = Complexed EDTA + Free EDTA

EQUIPMENT

- Tanks:** Polypropylene, polyethylene, or PVC
- Racks:** Stainless steel or Teflon® (or similar) coated
- Heaters:** Teflon or Teflon® coated
- Filtration:** Continuous polypropylene cartridge or bag 1 -10 microns

HANDLING AND SAFETY:

Always wear proper personal protective gear including eye protection when working with or around these or any chemicals. Reading the MSDS prior to use is recommended.

NOTE: When using auto replenishment; it is important to determine the compatibility of pumps, lines, and ancillary equipment with the chemical materials being used.

When making manual additions of caustic and/or formaldehyde it is important to avoid heavy concentrations being poured into one area of the tank; small concentrations in multiple areas are preferred. Always avoid pouring any chemicals directly on parts being plated.

DISCLAIMER:

The data contained herein is based on information that Accu-Labs, Inc. believes to be reliable, but no expressed or implied warranty is made since conditions and use are beyond our control. Accu-Labs, Inc. and its agents disclaim all liability for any action taken or foregone on reliance upon such data.