

# Accu-Labs Inc.

4831 S. Whipple Avenue  
Chicago IL 60632  
Phone: 773.523.3100 Fax: 773.523.4008  
[www.accu-labs.com](http://www.accu-labs.com)

**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 |
| • <b>855-M</b>                          | 12.0% by volume  |
| • <b>855-A</b>                          | 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 <sup>2</sup> /gal) | 0.50-1.50 Ft <sup>2</sup>  | 1.00 Ft <sup>2</sup> |
| 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:

| <b>% Copper</b>      | <b>855-A liters</b> | <b>855-R liters</b> | <b>NaOH</b> | <b>HCHO</b> | <b>Bail-out liters</b> |
|----------------------|---------------------|---------------------|-------------|-------------|------------------------|
| 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 CuSO<sub>4</sub>5H<sub>2</sub>O 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<sup>++</sup> standard to violet end point

### CALCULATION:

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

Free EDTA g/l = mls Cu<sup>++</sup> 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.*