

# ACCU-LABS INC.

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**A2LA Accredited ISO/IEC 17025:2005 Certificate # 2558.01**

## 485 CHROME SPECIAL Decorative, bright chromium plating process

### Introduction

Chromium plating today requires balancing the opposing demands for higher quality and lower costs. The **ACCU-LABS 485 CHROME SPECIAL Decorative Chromium Process** is formulated for that very purpose. **ACCU-LABS 485 CHROME SPECIAL** comes ready-to-use - the catalyst and buffer are built right in. Compatible with all common chromium processes, **ACCU-LABS 485 CHROME SPECIAL** provides dependable, economical results with maximum operator ease.

### Features and benefits

Simplified make-up and maintenance  
Excellent range of coverage  
Wide operating range

Easy to prepare and control  
Maximum production rate  
Simpler for personnel to use

| <u>Chemical concentrations</u> | <u>Optimum</u> | <u>Range</u>       |
|--------------------------------|----------------|--------------------|
| Chromic acid                   | 32 oz/gal      | 28 - 45 oz/gal     |
| Sulfate                        | .17 oz/gal     | .15 - .30 oz/gal   |
| Ratio                          | 180 - 200      | 140 - 250          |
| Fluoride catalyst              | 1.00 g/L       | 0.75-1.5 g/L       |
| <b>Lo-Mist D/C</b>             | .15 % by vol   | .12 - .25 % by vol |

### New solution make-up (per 100 gallons)

|  |                 |            |
|--|-----------------|------------|
| <b>ACCU-LABS 485 CHROME SPECIAL</b> Compound |                 | 225 pounds |
| Sulfuric acid, 1.83 specific gravity         | 270 milliliters |            |
| <b>Lo-Mist D/C</b>                           | 20 fluid ounces |            |

This will yield a solution with the optimized parameters as shown above. Plating time will vary as required by your customers and plating conditions. In general, this solution will plate at a rate of 3 - 4 microinches per minute at 100 amps per square foot (assuming 10 % cathode efficiency).

### Operating conditions

|                                   |   |
|-----------------------------------|---|
| Tanks and equipment               | Lined steel or heat-resistant plastic             |
| Anodes                            | Tin-lead alloy (7 % tin)                          |
| Agitation                         | Mild mechanical preferred                         |
| Temperature                       | 100 - 120 <sup>0</sup> F (38 - 50 <sup>0</sup> C) |
| Cathode current density           | 50 - 200 amps per square foot                     |
| Anode current density             | 100 - 500 amps per square foot                    |
| Anode: cathode ratio              | 2: 1 minimum                                      |
| Surface tension, dynes/centimeter | 35 - 40 (45 maximum)                              |

### Preparation of new solution

1. Carefully review all equipment to verify that tanks, pumps, heaters, and related items meet the requirements for the work this line will do.
2. Thoroughly clean all tanks and equipment. Make certain that all surfaces which will contact the chromic acid solution have been thoroughly leached of oxidizable materials.
3. Fill tank <sup>2</sup>/<sub>3</sub> full with deionized water.
4. While agitating (mechanical preferred) slowly add the required amount of **ACCU-LABS 485 CHROME SPECIAL** compound. Mix until fully dissolved.
5. Bring solution to 90% of final volume, mix well, and add the sulfuric acid and **Lo-Mist D/C**.
6. Fill to final volume and mix. Analyze solution and fine-tune balance, if required.

The **ACCU-LABS 485 CHROME SPECIAL** solution is now ready for plating.

### Conversion of existing baths

**ACCU-LABS 485 CHROME SPECIAL Decorative Chromium** process is fully compatible with all existing systems, so that a simple "slide-in" conversion is acceptable. We suggest that a representative sample of the solution be sent to Accu-Labs for analysis and Hull cell testing. We will then advise the best conversion method for your specific plating conditions.

### Pretreatment for decorative chromium plating

Proper conditioning of the work to be plated is often more important than the rest of the plating operation. In most plating lines, this requires all normal cleaning and pickling stages, as well as plating with bright nickel such as the **NILUX Bright Nickel** process prior to plating decorative chromium. Nickel-plated work must be rinsed effectively and quickly prior to plating in the **ACCU-LABS 485 CHROME SPECIAL** solution. Insufficient rinsing will cause contamination problems, while long times between stages may passivate the nickel plate and cause whitewash. Counterflow rinsing is the most efficient way to provide improved rinsing and controlled contaminant introduction.

If **ACCU-LABS 485 CHROME SPECIAL** is being plated directly onto steel, work must be clean and free of metalworking lubricants, rust, fines, mold releases, and so on. Consult with your sales representative or Accu-Labs for information and assistance with pretreatment products.

### Analytical control of ACCU-LABS 485 CHROME SPECIAL bath

Regular analysis is the best way to assure continuous quality production from your plating line. If you have any questions about this analysis, please consult Accu-Labs for assistance.

#### **Equipment and chemicals required:**

|                                      |                                    |
|--------------------------------------|------------------------------------|
| 250-ml Erlenmeyer flasks             | various pipettes (5- and 20-ml)    |
| 100-ml volumetric flasks             | Hydrochloric acid, 50%             |
| 10 % Potassium iodide solution       | 0.100 N Sodium thiosulfate         |
| Starch indicator                     |                                    |
| Sulfate tubes (Kocour Co., Chicago)  | Barium chloride solution (300 g/L) |
| Kocour centrifuge, 1450 rpm          |                                    |
| Comparator kit (Kocour Co., Chicago) |                                    |

#### **Chromic acid:**

- 1) Draw a 5-ml sample of the plating solution. Dilute to exactly 100 ml with DI water and mix well.
- 2) Draw a 5-ml aliquot from the solution in Step 1.
- 3) Add 25 ml 10% potassium iodide solution
- 4) Add 25 ml 25% sulfuric acid or 50% hydrochloric acid.
- 5) Titrate against 0.100 N sodium thiosulfate to green-orange color.
- 6) Add starch indicator and continue titrating to blue-green endpoint.
- 7) Chromic acid, oz/gal = titration x 1.77
- 8) **ACCU-LABS 485 CHROME SPECIAL addition, in pounds =**  
 $(32 - (\text{result from \# 7})) \times \text{Volume (gallons)} \times 0.07$

#### **Sulfate determination**

- 1) Draw a 20-ml sample of the chrome plating solution and dispense into a Kocour sulfate tube.
- 2) Add 5 ml of 50% hydrochloric acid and shake.
- 3) Fill the tube to the base of the neck with barium chloride solution and shake.
- 4) Place into centrifuge and spin for 5 minutes. **NOTE:** Always pair off samples by filling opposing holder with either another sample or water blank.
- 5) Read sulfate in ounces per gallon directly from stem of sulfate tube. Tap with pen or pencil if necessary to level precipitate.
- 6) Determine the optimum sulfate content by dividing the chromic acid content by 190 (ratio). If an addition of **ACCU-LABS 485 CHROME SPECIAL** is required, assume that the sulfate should be 0.17.
- 7) **If the ratio is high**, the sulfate addition, in milliliters, =  
 $(\text{SO}_{4\text{req'd}} - \text{SO}_{4\text{actual}}) \times \text{Volume (gallons)} \times 0.15$
- 8) **If the ratio is low**, the barium carbonate addition, in ounces, =  
 $(\text{SO}_{4\text{actual}} - \text{SO}_{4\text{req'd}}) \times \text{Volume (gallons)} \times 0.02$

**Trivalent chromium** - follow directions supplied with Kocour comparator kit

### **Filtration and purification**

All plating solutions benefit from filtration. For bright chromium plating, many different types of insolubles develop over time. These solids, such as barium sulfate or insoluble lead species, can adversely affect the quality of your production. Consult with your filtration products supplier for advice on the best products for filtration and agitation of the **ACCU-LABS 485 CHROME SPECIAL** solution.

Metallic contamination is fairly common in chromium plating, usually caused by work lost in the plating tank, drag-in from the nickel rinses, corrosion of busing, or leaks in the tank liner. Most metallic impurities will not significantly affect the **ACCU-LABS 485 CHROME SPECIAL** solution. However, drag-in of nickel means drag-in of sulfate and chloride as well, and these are problems. Check and control sulfate as described previously. Chloride should be maintained below 50 milligrams per liter (mg/L); above 100 mg/L, work can develop a grayish color and treatment is required. Chloride can be removed by high cathode; low anode dummyming or precipitation with silver oxide.

Trivalent chromium is another common nuisance in chromium plating: it binds with three times its weight in hexavalent chromium. In effect, it reduces the chromic acid available for plating, throwing off the bath's ratio. It is usually the result of improper (low) anode to cathode ratio. Other causes include the typical treatment for chloride (above) or contamination with organics. Trivalent chromium below 1 % is not a problem, but concentrations above 3 % require treatment. Treatment for trivalent chromium build-up requires dummyming under high anode; low cathode conditions.

The best and simplest ways to minimize contamination of the **ACCU-LABS 485 CHROME SPECIAL** solution are the use of deionized water for make-up and replenishment, and proper rinsing of work prior to plating. These will prevent 90 % of potential contamination problems.

### **Mist control for ACCU-LABS 485 CHROME SPECIAL**

Because of the inefficiency of the chromium plating process, mists are produced by chromium plating. These mists contain hexavalent chromium and other chemicals which are hazardous to employees, the environment, and your other plating processes. Many technologies and techniques are available to minimize the effects of these mists. The most effective is the use of **Lo-Mist D/C** or **Lo-Mist M/R** in your **ACCU-LABS 485 CHROME SPECIAL** solution. Each of these products, used at very low concentrations, can reduce misting by 99 % or more. The combined benefits of reduced surface tension and foam blanket provide both a safer work environment and regulatory compliance.

### **Rinsing and drying after plating**

Hexavalent chromium compounds are hazardous - corrosive and toxic. Plating solution residues on the work pieces present a potential hazard for your personnel and your customers who handle these parts after plating. These facts make rinsing after plating a very important part of a quality product.

Just as it is very helpful after the nickel plate, counterflow rinsing is the most efficient and effective manner of protecting your employees and customers. Properly used, counterflow rinsing will reduce the drag-through of the plating solution and reduce the demand on your waste treatment system. Contact Accu-Labs for more information regarding the benefits of counterflow rinsing for your plating applications.

### **ACCU-LABS 485-A CHROME CATALYST**

To help your plating operation run smoothly, **ACCU-LABS 485 CHROME SPECIAL Compound** is formulated with the catalyst built right in. Various conditions, however, may require a higher catalyst concentration. For those applications, **ACCU-LABS 485-A CHROME CATALYST** can be added directly to the solution. This product is highly concentrated, and must be used sparingly. Laboratory testing is strongly advised before additional catalyst is used.

### **Fume suppressants**

Decorative chrome platers are currently required to maintain a maximum surface tension of 45 dynes per centimeter in the chrome plating solution, and maintain records to demonstrate compliance with these regulations. **Lo-Mist D/C** and **Lo-Mist M/R** are formulated to help the decorative chrome plater meet regulatory and safety demands.

### **Handling and storage**

**ACCU-LABS 485 CHROME SPECIAL Compound** and related products are hazardous chemicals and are highly irritating to skin and mucous membranes. Read and understand the Material Safety Data Sheets prior to working with any of these chemicals. Proper safety precautions should always be observed. Read, understand, and follow all safety information for all chemicals used. This consideration should include all stages of the plating cycle.

### **Non-warranty**

The information contained in this bulletin is, to the best of our knowledge, true and accurate. All recommendations are made without guarantee, and Accu-Labs Inc. disclaims any and all liability arising from the use of this product or the information contained herein.