

Luster-On Products

Technical Data Sheet

ZINCO

Acid Zinc/Cobalt Alloy Plating Process

I. GENERAL DESCRIPTION

Luster-On Zinco is a chloride based non-ammoniated zinc-cobalt alloy plating bath that will produce fully bright highly corrosion resistant deposits over a wide current density range. The system was designed to be used in both barrel and rack operations. Other advantages include economy of operation, no chelates or ammonia, and waste treatment by simple neutralization and metal precipitation. Luster-On Zinco produces deposits with uniform cobalt levels over wide current densities, resulting in a process, which produces superior corrosion resistance while maintaining ease of chromating with standard zinc chromates.

READ MATERIAL SAFETY DATA SHEET BEFORE USING THIS PRODUCT

II. CHEMICAL COMPOSITION

	<u>Preferred</u>	<u>Range</u>
Zinc Metal	5.5 oz./gal.	5.0 - 6.0
Cobalt Metal	0.35 oz./gal. (Barrel) 0.50 oz./gal. (Rack)	0.25 - 0.55
Total Chloride	18.0 oz./gal.	17.0 -19.0
Boric Acid	3.0 oz./gal.	2.5 - 3.5
pH	5.5	5.2 - 5.8

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LUSTER-ON ZINCO (cont'd)

III. SOLUTION MAKE-UP

READ MATERIAL SAFETY DATA SHEETS ON ALL BATH COMPONENTS BEFORE MAKING UP BATH

	<u>Rack Operation</u>	<u>Barrel Operation</u>
Zinc Chloride (ZnCl ₂)	11.5 oz./gal	11.5 oz./gal
Cobaltous Chloride	2.0 oz./gal	1.4 oz./gal
Potassium Chloride (KCl)	23.0 oz./gal	23.5 oz./gal
Boric Acid (H ₃ BO ₃)	3.0 oz./gal	3.0 oz./gal
Luster-On Zinco Wetter	4.0% by volume	4.0% by volume
Luster-On Zinco Brightener	0.5% by volume	0.5% by volume

It is recommended that the tank be leached with a 2-3% by volume Muriatic Acid Solution before the plating solution is added, especially if new or newly lined tanks are being used. Old tanks that have contained other types of electroplating solution should not be used. After allowing the leach solution to soak for a minimum of 8 hours, the tank should be rinsed thoroughly and the solution made up as follows:

1. Fill the tank to 2/3 of the operating level with clean water.
2. Add and dissolve with agitation the Boric Acid and Potassium Chloride. This may be helped by putting the chemicals in the plating barrel and rotating the barrel.
3. Add and dissolve the metal chlorides. The liquid versions may be easier to use - a gallon of 50% Zinc Chloride is equivalent to adding 6.5 pounds of the powder and a gallon of liquid Cobaltous Chloride is equivalent to 5.5 pounds of cobalt chloride.
4. If pH is higher than 5.5, reduce to this value with Hydrochloric Acid.
5. Add the required amounts of Zino-W Wetter and Zinco Brightener in that order and agitate well.
6. Add water until solution is at operating level.

LUSTER-ON ZINCO (cont'd)

IV. SOLUTION COMPONENTS

A. Zinc Metal

The recommended range should be maintained. Routine analysis of the zinc metal concentration is suggested, making a necessary addition based on the analysis. The metal content can be increased by the addition of zinc chloride liquid 50% (6.5 lbs./gal.) or granular zinc chloride. Adjusting the anode area will minimize the need for zinc chloride additions.

Low concentrations of zinc cause burning in high current density areas and may result in excessively high cobalt levels in high current density areas of the deposit. This can result in problems in obtaining satisfactory chromate conversion coatings. Low zinc metal concentrations will also increase the sensitivity of the solution to excessive brightener concentrations.

High concentrations of zinc can result in a decrease in throwing power, but allow plating at higher current density. Higher concentrations of zinc also result in more uniform distribution of cobalt in the deposit, but may lower the corrosion protection aspects of the deposit.

B. Cobalt Metal

The recommended range should be maintained through routine analysis of the solution and necessary additions. The cobalt concentration can be increased with either powdered or liquid cobaltous chloride. Powdered cobaltous chloride is approximately 25% by weight cobalt metal and the liquid version is 14% cobalt metal.

Low concentrations of cobalt lower the corrosion protection value of the deposit.

High concentrations yield difficult to chromate deposits characterized by dark high current density areas after chromating.

C. Total Chloride

The chloride content increases when either zinc chloride, cobalt chloride or potassium chloride is added and calculates as total chloride. Routine analyses and additions are necessary to maintain the proper concentration range.

Low concentrations of chloride cause reduced conductivity, anode polarization, and burning in high current density areas.

LUSTER-ON ZINCO (cont'd)

IV. SOLUTION COMPONENTS (continued)

C. **Total Chloride** (continued)

High concentrations of chloride cause clouding of the plating solution, lower tolerance to higher temperatures, and reduced effectiveness of the brightener system .

D. **Boric Acid**

Boric Acid is used as a pH buffer and assists in the solubilizing of other bath components.

Low concentrations of Boric Acid may result in high operating pH at the plated surface with resulting high cobalt content in the deposit and chromating difficulty. Low concentrations may also contribute to high current density burning.

High concentrations of Boric Acid cause clouding of the plating solution, insolubility of brightener, and rough deposits.

E. **pH**

The optimum pH of the bath is 5.5 - 5.7 and should be checked and corrected daily. After addition of chlorides, the pH should be checked, and if necessary, more hydrochloric acid diluted, 4 to 1, added.

Low pH will result in the need for more frequent treatment for the removal of ferrous iron and brightener instability. High pH will result in higher levels of cobalt in the deposit and may lead to chromating difficulty.

F. **Zinco Brightener**

Additions of brightener should be initially determined by Hull Cell tests. Brightener depletion occurs because of the plating process and drag-out. Additions can be made based on ampere-hours once a consistent routine has been established.

High brightener concentration, over 1.0% by volume, will cause stressed deposits and low current density dullness. Low brightener concentrations will cause overall dullness. Small daily additions of brightener are preferred.

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IV. SOLUTION COMPONENTS (continued)

F. **Zinco-W Wetter**

Zinco-W Wetter is consumed by drag-out and additions should be made based upon Hull Cell tests and/or estimated drag-out loss. Excessively high concentrations of wetter may cause some dullness in the low current density areas. Low concentrations of wetter cause dull plating and pitting in high current densities, and may result in a clouding of the plating solution.

V. PLATING CONDITIONS

A. **Temperature**

The recommended temperature range for operating this solution is 70°- 85°F. In this range, optimum cobalt codeposition and brightness will be obtained. Concentrations of cobalt in the deposit will increase as the operating temperature rises. Also, higher temperatures may cause increased brightener consumption and lessened throwing power.

B. **Current Density**

The recommended cathodic current density range is 2 to 40 amps per square foot. Current is one of the most important variables affecting the amount of cobalt co-deposited in the plate.

Too high a current density may result in excessive cobalt in the deposit with subsequent chromating difficulty of the deposit. Excessively high current density may also result in burning.

Too low a current density may result in excessive plating times and in deposits with less corrosion resistance than required due to lower than expected levels of co-deposited cobalt.

C. **Agitation**

Agitation should be supplied with air for all plating solutions, rack or barrel. Low pressure, clean filtered air from an air pump, not a compressor, is recommended. Too much pressure will cause excess foaming. Insufficient agitation will result in burning at the high current density areas. More importantly, air agitation is essential to promote uniform distribution of the cobalt in the deposit. Air agitation also is helpful in controlling iron in the solution.

D. **Filtration**

Filtration of this solution is necessary for both barrel and rack installations to remove precipitated ferric iron and other contamination. The filter should have the capacity to turn over the solution 2 to 3 times per hour. The filter should not contain metal parts that will come into contact with the solution. To remove iron hydroxides, a 10 micron filter is recommended.

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V. PLATING CONDITIONS (continued)

E. Anodes

Only zinc anodes are necessary, however, the anodes should be 99.99% zinc, as listed in the A.S.T.M. Specification Description of Special High Grade Zinc. Ball anodes can be used with titanium anode baskets. However, when using titanium anode baskets avoid voltages higher than 9 volts and keep the baskets full. When using zinc slabs, titanium anode hooks must be used. Anode area of 1.5 times cathode area or greater is recommended. It is recommended that anode bags be used.

F. Cooling

Cooling coils of titanium or teflon are recommended if excessive temperatures are to be encountered. Making the titanium coil slightly anodic is recommended to keep it from the corrosive effects of direct current.

G. Tanks

Acid resistant plastic lined tanks, such as Koroseal, polypropylene or polyethylene are suitable. Contact the equipment department of Luster-On Products for specific recommendations and assistance.

VI. SOLUTION CONTAMINATION TREATMENT

A. Treatment for Iron

If iron contamination is suspected, a solution sample should be submitted to the Luster-On Laboratory to determine level of contamination. If excessive, treat as follows:

1. Pump solution into clean lined holding tank. The last several inches of the solution in the plating tank can be left behind and discarded if not clean. Adjust pH of solution to 5.5 - 6.0
2. To the adjusted solution, add 1 pint of 30% Hydrogen Peroxide, diluted to 2 gallons with water, to every 500 gallons of plating solution. More Hydrogen Peroxide may be necessary if iron level is extremely high.
3. Mix in the Hydrogen Peroxide addition well and allow solution to settle overnight.
4. Pump the solution back into the plating tank through a 10 micron filter. In this operation, care should be taken not to pump from the bottom of the tank and again the last several inches can be left behind.
5. Have the solution analyzed and add the necessary chemicals. Brightener and Wetter additions also will be needed and amounts can be determined by Hull Cell tests.

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VI. SOLUTION CONTAMINATION TREATMENT (continued)

B. Treatment for Metallic Contamination

Low current density dummyming is effective in removing some metallic and organic contamination. Usually a current density of 1-3 amps per square foot is recommended. The effectiveness of this treatment can be measured beforehand by Hull Cell tests. Contact the Luster-On Customer Service Laboratory for specific contamination problems.

C. Treatment for Organic Contamination

Electrolytic breakdown products and oil emulsification can lead to organic contamination in both barrel and rack operations. In most cases, carbon treatment is successful in removing this type of contamination. Carbon filtration is effective in mild cases, however batch treatment (4 lb. activated carbon per 100-gallons) is suggested for thorough removal of organic contaminants. Again, effectiveness of treatment can be measured by Hull cell tests and the Luster-On Customer Service Laboratory can be contacted for specific contamination problems.

VII. PACKAGE

5-gallon non-returnable containers and 55-gallon non-returnable drums.

VIII. STORAGE

Store in a closed container at moderate temperatures. Protect from freezing.

IX. DISPOSAL

Treatment and disposal of all chemicals should be done according to Federal, State and Local Regulations. Zinc plating solutions should be treated according to accepted industry practice for precipitation of zinc metal and neutralization.

X. SAFETY AND HANDLING PRECAUTIONS

Zinco Plating solutions prepared per this data sheet are mildly acidic industrial products.

DO NOT GET IN EYES; AVOID SKIN CONTACT; DO NOT TAKE INTERNALLY; EXERCISE NORMAL SAFETY PRECAUTIONS TO AVOID EYE AND SKIN CONTACT.

FIRST AID IN CASE OF CONTACT

FOR EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes. Get immediate medical attention.

FOR SKIN CONTACT: Wash the affected area thoroughly with soap and water. Wash contaminated clothing before reuse. Seek medical attention, if warranted.

IF SWALLOWED: Rinse out mouth thoroughly with water. Give water to drink without delay. Seek medical attention.

LUSTER-ON ZINCO (cont'd)

KEEP OUT OF REACH OF CHILDREN

FOR INDUSTRIAL USE ONLY

This product is sold for industrial use only. Our suggestions for its use are based upon tests and procedures that from experience we believe to be reliable. Since the use is beyond our control, neither we nor our distributors can assume responsibility, either expressed or implied for the results and/or for violation of any patents or any claims resulting from such use.

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Rev. 03/23/01

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Acid Zinc/Cobalt Alloy Plating Process

Typical Chromate Protection - Conventional Zinc (0.5 mils thickness)

Color	Typical Hours to White Corrosion Products (WCP)
Clear/Blue Bright	8-24
Yellow	72-120
Bronze	96-192
Black (Ag based)	48-96
Olive Drab	120-288
Green	168-192

Typical Chromate Protection - Zinc-Cobalt Alloy (0.5 mils thickness)

Color	Typical Hours to White Corrosion Products (WCP)	Typical Hours to Red Corrosion Products (RR)
Clear/Blue Bright	24-48	384-600
Yellow	264-360	504-792
Bronze	264-360	504-792
Black (Ag based)	120-192	384-600
Olive Drab	264-360	504-792
Green	264-360	504-792