

Luster-On Products

Technical Data Sheet

Z-52/53W

Acid Zinc Plating Process

I. GENERAL DESCRIPTION

Luster-On Z-52/53W is a chloride based acid zinc plating system that will produce full bright ductile deposits over a wide current density range. The system is designed to be used in both barrel and rack operations. The Z-52/53W system consists of a concentrated liquid brightener, Z-52, and a liquid wetting agent, Z-53W, specifically formulated to limit co-deposition of organics in the zinc layer. Other advantages are high cathode efficiency, high cloud point, low internal stress, and superior plate distribution. The Z-52/53W system functions well in either ammoniated or non-ammoniated formulations. For those interested in maintaining the plating salts and wetting agent simultaneously, the Z-53W Salts package, a complete addition agent to be used with Z-52, is also available.

READ MATERIAL SAFETY DATA SHEETS ON Z-52/Z-53W AND ZINC CHLORIDE BEFORE MAKING UP BATH

II. CHEMICAL COMPOSITION

	<u>Preferred</u>	<u>Range</u>
Zinc Metal		
Rack	4.0 oz./gal.	2.5 - 4.5
Barrel	3.0 oz./gal.	2.0 - 4.0
Total Chloride	17.5 oz./gal.	16.0 - 18.0
Boric Acid or	2.5 oz./gal.	2.5 - 3.5
Ammonium Chloride	4.0 oz./gal.	4.0 - 6.0
pH	5.5	5.2 - 5.8

III. SOLUTION MAKE-UP

<u>Non Ammoniate</u>	<u>Rack Operation</u>	<u>Barrel Operation</u>
Zinc Chloride (ZnCl ₂)	8.3 oz./gal.	6.3 oz. /gal.
Potassium Chloride (KCL)	27.5 oz./gal.	29.7 oz. /gal.
Boric Acid (H ₃ B ₀ ₃)	2.5 oz./gal.	2.5 oz. /gal.
Luster-On Z-52	0.1% by volume	0.1% by volume
Luster-On Z-53W	4.0% by volume	4.0% by volume

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III. SOLUTION MAKE-UP (Continued)

<u>Ammoniated</u>	<u>Rack Operation</u>	<u>Barrel Operation</u>	
Zinc Chloride (ZnCl ₂)		8.3 oz./gal	6.3 oz./gal.
Potassium Chloride (KCl)		21.9 oz./gal.	24.2 oz./gal.
Ammonium Chloride		4.0 oz./gal.	4.0 oz./gal.
Luster-On Z-52	0.1% by volume		0.1% by volume
Luster-On Z-53W	4.0% by volume		4.0% 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 since acid zinc has a very low tolerance to metallic contamination. 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 1/2 of the operating level with clean water.
2. Add and dissolve with agitation the selected plating salts. This may be helped by putting the salts in the plating barrel and rotating the barrel.
3. Add and dissolve the Zinc Chloride. Liquid Zinc Chloride may be easier to use. A gallon of 50% Zinc Chloride is equivalent to adding 6.5 pounds of the powder.
4. If pH is higher than 5.8, reduce to range with Hydrochloric Acid.
5. Start with an add of 4.0% by volume Z-53W and 0.075% by volume Z-52. Increase the Z-52 concentration in small increments, if necessary, to achieve desired brightness.
6. Add water until solution is at operating level.

Contact the Luster-On Customer Service Laboratory for make-up instructions and operating parameters if the Z-53W Salts package is used in the process.

IV. SOLUTION COMPONENTS

A. **Zinc Metal**

The recommended range should be maintained. Sufficient quantity of zinc anode balls in titanium anode baskets should be maintained to keep the zinc metal within the required range. The addition of zinc metal by the use of zinc chloride should not be necessary in a properly maintained bath.

Low concentrations of zinc cause burning in high current density areas and excessive use of brightener. High concentrations of zinc cause streaking and pitting in medium current densities and poor coverage in low current densities. Additions of brightener can usually clear up the low current density areas.

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IV. SOLUTION COMPONENTS (Continued)

B. Total Chloride

The chloride content increases when Zinc Chloride, Ammonium Chloride or Potassium Chloride is added and calculates as Total Chloride. Routine analyses and additions are necessary to maintain the proper concentration range, especially in high drag-out situations.

Low concentrations of chloride cause reduced conductivity, dullness or skip plating in low current density areas, or gray or white deposits in high current density areas. Excessive use of brightener and wetter can also occur.

High concentrations of chloride cause clouding of the plating solution and intolerance to higher temperatures.

C. Boric Acid or Ammonium Chloride

Boric Acid or ammonium chloride is used as a pH buffer and assists in the solubilizing of other bath components. Concentration should be determined periodically and maintained between 2.5 and 3.5 ounces per gallon of boric acid or 4-6 ounces per gallon if ammonium chloride is used.

Low concentrations contribute to burning in high current density areas and excessive use of brightener. High concentrations cause clouding of the plating solution, insolubility of brightener, and brown haze in low current density areas.

D. pH

The optimum pH of the bath is 5.5 and should be checked and corrected daily.

Low pH, (below 5.0), is usually a result of adding an excess of acid, and will result in misplating and matte deposits. High pH, (above 6.0), causes burning and dull deposits and may lead to initial precipitation of zinc.

E. Z-52 Brightener

Additions of brightener should be determined by Hull Cell tests or by examination of the work. Brightener depletion occurs due to the plating process and drag-out. It is preferred that brightener additions be made with a brightener feed pump controlled by an ampere hour meter connected to the rectifier.

High brightener concentration (over 0.2% by volume) will cause streaks and pitting. Low brightener concentrations (less than 0.05%) will cause burning in the high current density areas and overall dullness.

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IV. SOLUTION COMPONENTS (Continued)

F. Z-53W Wetter

Z-53W 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 blistering of the deposit and/or adversely affect solubility of solution components. Low concentrations of wetter cause a dark film on the work, dull plating in high current density areas, and may result in a clouding of the plating solution. One gallon of Z-53W should be added with each 50-lb. addition of a chloride salt to maintain losses to dragout.

V. PLATING CONDITIONS

A. Temperature

The Z-52/53W system can operate up to 150° F, however temperatures above 95° F will cause an increase in brightener consumption to maintain full bright deposits. The most economical operation will result when the temperature is maintained between 70° F. Most tanks require cooling coils to maintain the correct temperature.

B. Current Density

The recommended current density range for barrel plating is 2 to 15 amps per square foot. Voltage: 4 to 9 volts. For rack plating, the average current density range is 20 - 30 amps per square foot. With rack plating, sufficient rates of agitation are necessary to plate at higher current densities.

C. Agitation

Agitation for rack plating can be supplied with cathode rod, air, or solution circulation via filter pump. Cathode rods should be operated at a rate of 4 to 10 feet per minute. Low pressure, clean filtered air from an air pump, not a compressor, is recommended. Insufficient agitation will result in burning at the high current density areas.

D. Filtration

Filtration of this solution is necessary for both barrel and rack installations to remove precipitated iron hydroxides, zinc fines 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

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. When using zinc slabs, titanium is used for anode hooks. Anode area of 1.5 times cathode area or greater, is recommended. Avoid voltages higher than 9 volts when using titanium anode baskets and always keep baskets full of zinc balls. Voids may cause damage to the titanium basket. Anode bags are recommended.

F. Cooling

Cooling coils of titanium or Teflon are recommended. 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 is suspected, a solution sample may be submitted to the Luster-On Laboratory to determine the 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 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 (4lb. 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 may be contacted for specific contamination problems.

VII. PACKAGE

Luster-On Z-52 is available in 5-gallon non-returnable containers and 55-gallon non-returnable drums.

Luster-On Z-53W is available in 5-gallon pails and 55-gallon drums.

VIII. STORAGE

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

IX. DISPOSAL

Treatment and disposal 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. Concentrated Brightener should be disposed of by incineration according to Federal, State and Local Regulations.

X. SAFETY AND HANDLING PRECAUTIONS

Luster-On Z-52 is a mildly acidic industrial product.

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

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X. SAFETY AND HANDLING PRECAUTIONS (Continued)

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

FOR SKIN: 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.

KEEP OUT OF REACH OF CHILDREN

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