

ZINCOBRITE ALS

ACID CHLORIDE ZINC PLATING PROCESS

INTRODUCTION

ZINCOBRITE ALS is an acid chloride zinc process producing bright, highly leveled deposits.

ZINCOBRITE ALS can be used for rack and barrel plating with ammonium or potassium chloride based systems.

BENEFITS

- Mirror bright, leveled deposits
- Wide current density range
- Aqueous additives – no oiling
- High cloud point – can operate at elevated temperatures
- Easy to control
- Economical to use
- Process includes an additive imbalance rescue product
- Same operational additive package for either ammonium or potassium chloride systems
- Excellent acceptance of passivates

SOLUTION MAKE-UP

Zinc Chloride	40 – 60 g/L (5.3 – 8.0 oz/gal)*
Ammonium Chloride	100 g/L (13.4 oz/gal)
Or Potassium Chloride Plus Boric Acid	200 g/L (26.7 oz/gal) 20 g/L (2.7 oz/gal)
Zincobrite ALS Carrier (Starter)	3.5% v/v
Zincobrite ALS Brightener	2.0 ml/L (7.6 ml/gal)

*Depending on Current Density

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OPERATING DATA

Zinc	20 – 30 g/L (2.7 – 4 oz/gal)
Chloride	105 – 203 g/L (14.0 – 27.1 oz/gal)
pH	4.5 – 5.8 (ammonia) / 5.0-5.5 (potassium)
Temperature	60 – 105°F (73°F optimum)
Cathode Current Density	20 – 38 ASF (Rack) / 5 – 15 ASF (Barrel)

EQUIPMENT

Tanks	Hard rubber-lined steel, polypropylene or PVC.
Heaters	PTFE immersion with thermostatic control.
Cooling	Titanium, PTFE or polypropylene heat exchangers or cooling coils should be used if required.
Filtration	Continuous recommended, all plastic construction pump. Should give 2-3 bath turnovers per hour.
Agitation	Air or solution movement to provide mild agitation for rack plating.
Anodes	High purity zinc (99.95%) with titanium hooks or in titanium baskets, with anode bags. 2:1 surface area ratio to cathode area

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INSTALLATION

It is essential that the tanks to be used for ZINCOBRITE ALS are thoroughly cleaned and leached before any product is introduced. For new tanks or linings extended warm leaching is required. Automated Chemical Solutions Lab can evaluate existing bath compatibility with PMD additives and provide recommendations for startup.

DO NOT PRE-MIX ADDITIVES

1. Clean the process tank with water and leach with 10% v/v hydrochloric acid, pumping through all the filters, pumps and pipework. Allow to stand overnight then thoroughly clean with water.

If there is any questions regarding the cleaning procedure, please contact Automated Chemical Solutions for technical support.

2. Add tap water to one-half tank volume and heat to 120°F.
3. Add the appropriate amount of zinc chloride:
 - a) 100 g/L ammonium chloride and stir to dissolve **OR**
 - b) 200 g/L potassium chloride plus 20 g/L boric acid and stir to dissolve.
4. Allow to cool to 68 – 86°F then add 3.5% v/v **Zincobrite ALS Carrier**.
5. Filter the solution thoroughly and adjust the pH:
 - a) pH 4.5 – 5.8 (ammonium) **OR**
 - b) pH 5.0 – 5.5 (potassium/boric)
6. Add 2 ml/L **Zincobrite ALS Brightener**, top up to volume and mix thoroughly.
7. The solution is now ready to use.

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MAINTENANCE AND CONTROL

The zinc and chloride concentration should be analyzed regularly using the methods detailed in *Analysis Methods* and adjusted accordingly.

ZINCOBRITE ALS Brightener:

As a guide, add 200 – 250 ml/1000 amp-hours

The consumption of Brightener will vary with drag-out and electrolysis.

ZINCOBRITE ALS Carrier:

The Carrier is usually consumed by drag-out only and additions can be linked to the chloride analysis and additions (basically, adding back Carrier at the Make Up percentage)

For example:

If nominal chloride conc. = 120 g/l

And nominal **Carrier** conc. = 35 ml/l (3.5% vv)

And chloride conc. by analysis is 102 g/l

Then the chloride addition should be 18 g/l (120 – 102 or 15% of nominal)

And **Carrier** addition should be 5.3 ml/l (15% of nominal)

Or *alternatively* for **Carrier**: add 50 – 100 ml/1000 amp-hours

pH:

Keep within range with 50% v/v hydrochloric acid to lower and either 10% w/v solution of potassium hydroxide or ammonia to raise. **During normal operation the pH will tend to rise.**

Zinc Concentration:

This can vary between 20 and 30 g/l depending on requirements.

***For higher current densities use higher zinc concentrations.**

Deposition Rate:

At 28 ASF the current efficiency is 95% and the deposition rate is 0.03 mils/minute.

Qualitative Iron Test and Treatment Procedure:

Method

1. Place 30-40 ml sample of bath in 100 ml beaker (if not clear – filter).
2. Add 1 ml of 4 to 5% hydrogen peroxide (dilute concentrated peroxide with water).
3. Look for precipitate in beaker.
4. If slight-to-heavy precipitate treat bath as follows (per 1,000 gallons):
 - Make a dilute gallon of peroxide (water plus 0.5 L 35% hydrogen peroxide).
 - Mix well in the plating bath.
 - Repeat Steps 1 – 4 until most of the iron is precipitated out determined in beaker test.
 - Filter out precipitated iron from plating bath.

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ANALYSIS METHODS

Zinc

Reagents

1. 0.1M EDTA
2. Eriochrome Black T indicator
3. Ammonium chloride buffer solution (40 g/L ammonium chloride, 200 ml/L ammonium hydroxide, Deionized water to 1 liter)

Method

1. Pipette 2 mls of the plating solution into a 250 ml Erlenmeyer flask.
2. Add 50 mls buffer solution and 50 mls DI water.
3. Add a trace of Eriochrome Black T indicator.
4. Titrate with 0.1M EDTA to a blue end-point.

Calculation

Zinc (g/L) = mls of 0.1M EDTA X3.27

Replenishment

For every 1 g/L low add 2.1 g/L zinc chloride

Chloride

Reagents

1. 0.1N silver nitrate
2. Sodium chromate indicator – 20 g/L sodium chromate (aqueous)

Method

1. Pipette 10 mls of the plating solution into a 250 ml volumetric flask and make up to the mark with DI water.
2. Pipette 10 mls of the diluted sample into a 250 ml Erlenmeyer flask.
3. Add approximately 100 mls DI water.
4. Add approximately 2 mls of indicator solution.
5. Titrate with 0.1N silver nitrate. During titration a white precipitate of silver chloride will be seen immediately. The end point is when the solution/precipitate becomes reddish brown.

Calculation

Chloride (g/L) = mls of 0.1N silver nitrate X 8.875

Replenishment

For every 1 g/L low add 1.5 g/L ammonium chloride or 2.1 g/L potassium chloride

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ANALYSIS METHODS (Cont.)

Boric Acid (Potassium only)

Reagents

1. Mannitol
2. Bromocresol purple indicator
3. 0.1M sodium hydroxide solution

Method

1. Pipette 5 mls of the plating solution into a 250 ml Erlenmeyer flask.
2. Add mannitol to make a slurry then add a few drops of bromocresol purple indicator.
3. Titrate with 0.1N sodium hydroxide to a purple end point.
4. Record titrant = t ml.

Calculation

Boric acid (g/L) = mls of 0.1N sodium hydroxide X 1.24

Replenishment

For every 1 g/L low add 1 g/L boric acid

Hull Cell Tests

OPERATING CONDITIONS:

Hull Cell	-	267 ml
Temperature	-	90°F
Current	-	2 amps
Time	-	10 minutes
Anode	-	Zinc
Cathode	-	Polished Brass Panel
Brightener Adds	-	0.2 ml increments

Zincobrite ALS

Normal Panel

Zincobrite ALS

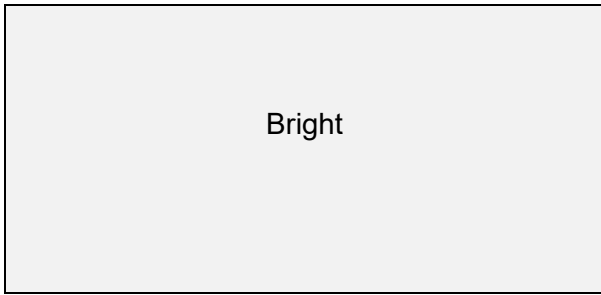
High Current Density Issue

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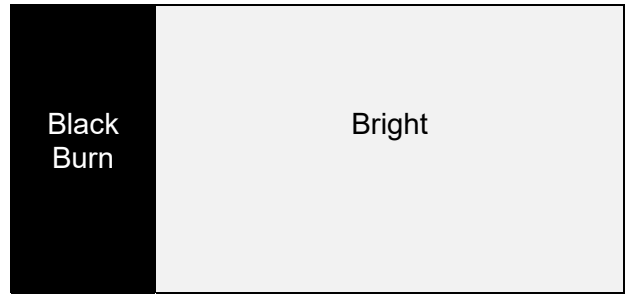


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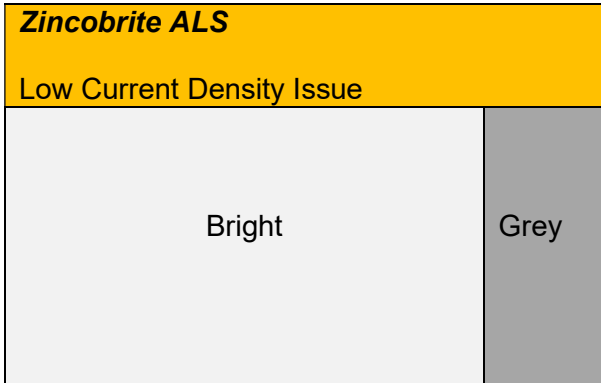
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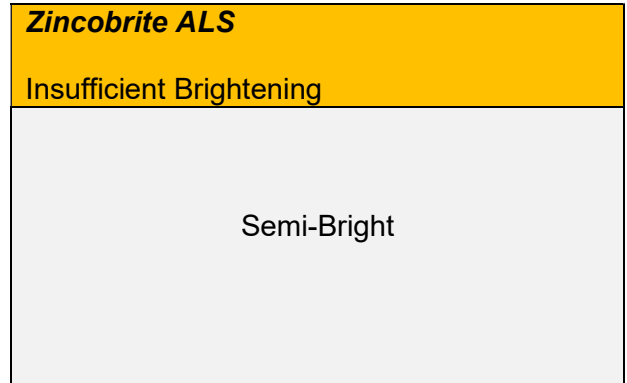
Normal



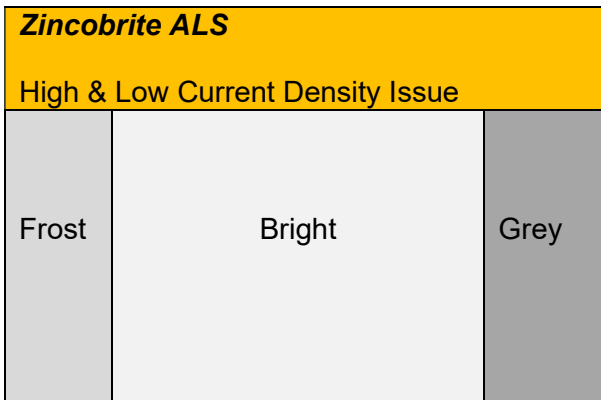
Low temperature, low zinc concentration,
Excessive current density, organic
Contamination, high current



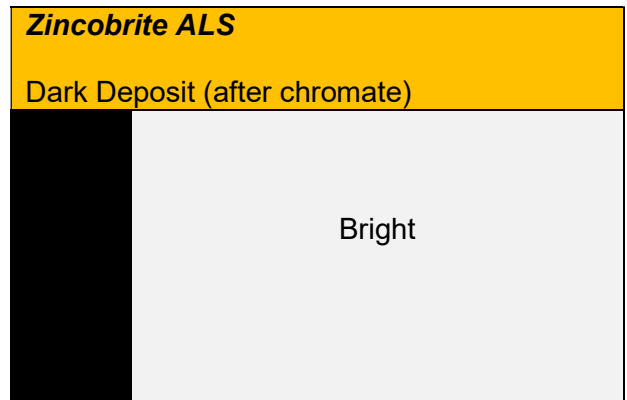
Low brightener, low chlorides, high pH,
high zinc concentration



Low Brightener, low current density



Low Brightener & Low Carrier



Iron (II) Contamination, pH too high

TROUBLE SHOOTING GUIDE

Contamination with foreign materials should be avoided. Copper, lead, cadmium, arsenic and antimony can cause problems with loss of brightness, dark deposits or poor color. They can usually be removed by

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plating out or by zinc dust treatment. Iron contamination should not exceed 80-100 ppm. Iron can be removed by additions of hydrogen peroxide (1-2 ml/l).

Problem	Reason	Remedy
Insufficient brightening and leveling. Low current density blue coloration	Low Brightener	Add 0.3-2.0 ml/L Brightener
	Low current density	Increase current density
Poor coverage at low current density	Low chloride concentration	Correct per analysis
	Low Carrier	Add 2-4 ml/L Carrier
High current density burning	Low temperature	Heat solution
	Low zinc concentration	Add zinc chloride per analysis
	Excessive current density	Reduce
	Organic contamination	Carbon treat
Roughness, pitting	pH too high	Reduce pH
	Suspended solids	Filter
Dark deposit	pH too high	Reduce pH
	Iron (II) contamination	Add 1 ml/L hydrogen peroxide for every g/L iron (II) and filter
Deposit will not passivate easily	Low Carrier	Add 2-4 ml/L Carrier
	Excessive concentration of additive decomposition products	Carbon treat
Barrel hole "burning"	Low temperature	Heat solution
	Low chloride concentration	Correct per analysis
	Iron (II) contamination	Add hydrogen peroxide (see above)
	Decomposition products	Carbon treat
Spots developing during passivation	Low Carrier	Add 2-4 ml/L Carrier
	Poor rinsing after zinc	Improve rinsing
Solution milky or oil on surface	Excess Carrier or Brightener	Add Zincobrite ALS Solubilizer in increments of 5-20 ml/L
Zinc metal growth	pH too low	Operate at the higher pH range
	Anode area too high	Reduce anode area until Zn in spec Dilute bath

STORAGE

Store in original containers above 40°F

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Safety

Avoid contact with eyes, skin and clothing. Wear chemical handler's gloves, goggles and protective clothing when handling. Read and understand Material Safety Data Sheet before using this product.

PRODUCT GROUPS

The following products are referred to in this data sheet.

PRODUCT NAME	PRODUCT NUMBER
Zincobrite ALS Carrier	584004
Zincobrite ALS Brightener	584003
Zincobrite ALS Solubilizer	584011

NOTICE

The information and recommendations of PMD (UK), Ltd. and Automated Chemical Solutions, Inc., and its representatives, regarding this product are, to the best of our knowledge, true and accurate. We make no guarantee of results because the conditions of actual use are beyond our control. We assume no liability for damages or penalties resulting from the use of this product or following our recommendations. Our recommendations and suggestions for use of this product are not intended to grant license to operate under or infringe any patent.

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