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COLZINC ACF-II

TECHNICAL DATA
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COLZINC ACF-II

PROCESS FOR ALKALINE CYANIDE-FREE ZINC PLATING

COLZINC ACF-II is a concentrated, multiple polyamine blend that produces a brilliantly bright deposit from alkaline cyanide-free plating solutions capable of plating bright, decorative work at temperatures of 125°F+ (5 2°C+).

COLZINC ACF-II operates over a wide zinc metal range of 0.75 - 3.5 opg (5.5 - 26.0 g/l) and produces extremely ductile deposits even with thickness in excess of 1.25 mil. (31.75 microns)

COLZINC ACF-II has excellent low current density covering and throwing power, and is especially good for rack plating parts with deep recesses such as fittings, tubes, or computer chassis.

COLZINC ACF-II is extremely tolerant to trace contaminants such as calcium, magnesium, lead, cadmium, iron, and chromium, which enter the plating bath via maintenance additions of caustic soda, tap water, zinc metal replenishment, and drag-in from the pre-plate processes.

COLZINC ACF-II is ideal for both low current density barrel plating and the wide range of current densities encountered with rack plating.

OPERATING PARAMETERS

RACK PLATING:

	RANGE	OPTIMUM
Zinc Metal:	0.75 - 2.5 oz/gal (5.5 - 18.75 g/l)	1.5 oz/gal (11 g/l)
Caustic Soda:	10 - 20 oz/gal (75 - 150 g/l)	16 oz/gal (120 g/l)
Operating Temperature:	65º - 125º F (18º - 52º C)	85º F (29º C)

BARREL PLATING:

	RANGE	OPTIMUM
Zinc Metal:	1.0 - 3.25 oz/gal (7.5 - 24.4 g/l)	2 oz/gal (15 g/l)
Caustic Soda:	12 - 20 oz/gal (90 - 150 g/l)	18 oz/gal (135 g/l)
Operating Temperature:	65° - 125° F (18° - 52° C)	85° F (29°C)

SOLUTION MAKEUP

A new bath may be prepared either by dissolving zinc anodes in caustic soda or by using zinc oxide and caustic soda. In either case, the highest purity grade materials available should be used to eliminate metal impurities in initial makeup. Baths are prepared as follows:

RACK PLATING:

	100 LITERS	100 GALLONS
Zinc Oxide:	1.4 kg	11.7 lbs
Caustic Soda:	12 kg	100 lbs
COLZINC ACF-II:	1.5 liters	1.5 gal
COLZINC ACF PURIFIER:	100 ml	13 fl/oz
COLGLO LCD BOOSTER:	25 ml	3.25 fl/oz
COLZINC ACF CONDITIONER:	100 ml	13 fl/oz

BARREL PLATING:

	100 LITERS	100 GALLONS
Zinc Oxide:	1.87 kg	15.6 lbs
Caustic Soda:	13.5 kg	112.5 lbs
COLZINC ACF-II:	2.0 liters	2.0 gal
COLZINC ACF PURIFIER:	100 ml	13 fl/oz
COLGLO LCD BOOSTER:	100 ml	13 fl/oz
COLZINC ACF CONDITIONER:	100 ml	13 fl/oz

1. Slurry zinc oxide by slowly adding to minimal amount of water in plating tank, or preferable, in a separate make-up tank
2. Slowly add caustic soda and water to approximately one-third the final volume
3. Stir continuously until all zinc oxide is dissolved
4. Dilute to near final volume with water and stir
5. Add COLZINC ACF-II additives, dilute to final volume with water and stir

MAINTENANCE ADDITIONS

COLZINC ACF-II	1 gallon per 12,000 - 20,000 ampere hours 1 liter per 3,200 - 5,300 ampere hours
COLGLO LCD BOOSTER	1 gallon per 1 to 5 gallons COLZINC ACF-II 1 liter per 1 to 5 liters COLZINC ACF-II
COLZINC ACF PURIFIER	1 gallon per 20 to 40 gallons of COLZINC ACF-II 1 liter per 20 to 40 liters of COLZINC ACF-II
COLZINC ACF CONDITIONER	Not used on a regular basis

ADDITION AGENTS

COLZINC ACF-II	is a unique and innovative blend of cationic polyamines used for leveling, grain refinement, brightening, and ductilizing the zinc deposit over a wide plating range.
COLGLO LCD BOOSTER	is an aldehyde-based additive for increasing overall brightness especially at mid to low current densities. It is also used to relieve deposit stress and helps eliminate the potential risks associated with immediate and latent blistering. Barrel operations typically use 1 gallon per 1 to 2 gallons of COLZINC ACF-II, whereas, rack operations use 1 gallon per 4 gallons of COLZINC ACF-II.
COLZINC ACF PURIFIER	(contains thiourea) is used to improve deposit clarity and eliminate low to mid current dullness. It is also used to eliminate blistering from gross overloads of COLZINC ACF-II. The use of this product varies from shop to shop and is dependent on the drag-in of contaminants, purity of basic chemicals and water hardness.
COLZINC ACF CONDITIONER	is generally used for start-ups only or on rare occasions at 0.05% to 0.1% by volume in a working bath to eliminate smoky dullness caused by trace metallic impurities.
COLZINC ACF FUME SUPPRESSOR-II	is a very potent foaming agent for eliminating caustic spray and controlling fumes at the surface of the plating bath.

TYPICAL CYCLE

PRE-PLATE TREATMENT

All alkaline non-cyanide zinc plating processes require the cleaning and pickling solutions be maintained at their optimum operating conditions. Unlike conventional cyanide and low cyanide electrolytes, which have sufficient cleaning and complexing capabilities to compensate for poor pre-plate treatment, alkaline cyanide free baths have practically no cleaning ability. Therefore, parts must be clean and free from oil films and soils prior to plating.

The following two cleaning and pickling cycles are recommended when using the COLZINC ACF-II process:

1. Hot alkaline soak clean
2. Hot alkaline electro-clean (anodic or periodic reverse)
3. Rinse
4. 30% to 50% Muriatic Acid pickle with 1% to 2% PICKLE PAL™
5. Rinse
6. Electro-caustic* (Recommended for heat treated and high carbon steels or difficult to clean parts)
7. Zinc Plate

or

1. Hot alkaline soak clean
2. Rinse
3. 30% to 50% muriatic acid pickle with 1% to 2% PICKLE PAL™
4. Rinse
5. Hot alkaline electro-clean (anodic or periodic reverse)
6. Rinse
7. Zinc Plate

*Electro caustic contains 13 to 20 opg (97.5 to 150 g/l) caustic soda. It is operated at ambient temperatures, with anodic current applied at 30 to 65 ASF (3.25 - 7 ASD). Parts do not require rinsing between the electro caustic and plating tanks. The electro caustic solution is usually changed once or twice per week.

POST TREATMENT

COLZINC ACF-II deposits can be chromated by any of the conventional post-plate chromate treatments, ranging from blue-bright to olive drab. A recommended cycle for post-plate treatment is as follows:

1. Zinc Plate
2. Cold Water Rinse
3. Acid Dip (0.25 to 0.5% Nitric Acid)
4. Cold Water Rinse (Optional)
5. Chromate Dip
6. Cold Water Rinse
7. Hot Water Rinse
8. Dry

ANALYTICAL PROCEDURE

ANALYSIS FOR ZINC METAL

1. Pipette 5 ml. bath sample into a 250 ml. Erlenmeyer flask and add 50 ml. distilled water
2. Add 20 ml. ammonium hydroxide buffer solution
3. Add approximately 0.2 gm. Eriochrome Black T Indicator Mix; add 25 ml. distilled water
4. Add 20 ml. 8% formaldehyde solution
5. Titrate immediately with Standard EDTA Solution 0.0575 M to a blue endpoint

FACTOR: (ml. Standard EDTA Solution 0.0575 m) x 0.10 = oz/gal. zinc metal. (oz/gal x 7.5 - g/l)

ANALYSIS FOR CAUSTIC SODA

1. Pipette 5 ml. bath sample into a 250 ml. volumetric flask
2. Add 10 ml. of 10% Sodium Cyanide Solution and 1 to 2 ml. Caustic Blue Indicator
3. Titrate with standard Sulfuric Acid Solution to a color change of yellow-green to blue

FACTOR: ml. Standard 0.94 N Sulfuric Acid Solution = oz./gal. Caustic Soda (oz/gal x -7.5 g/l)

PREPARATION OF ANALYTICAL REAGENTS

EDTA 0.0575 M - dissolve 21.6 gm. C.P. Di-sodium EDTA salt in distilled water, dilute to exactly one liter.

Formaldehyde 8% Solution - dilute 200 ml. 40% C.P. Formaldehyde to one liter with distilled water.

Eriochrome Black “T” Indicator Mix - grind together 1-part indicator and 100 parts sugar.

Sulfuric Acid 0.94 N - dilute 26.50 ml. C.P. Concentrated Sulfuric Acid to exactly one liter with distilled water.

HELPFUL HINTS

MAINTAINING THE ZINC LEVEL

The dissolution rate of zinc metal in the plating bath is determined by caustic soda content, anode area, temperature, agitation, drag-in/drag-out rate and electrical current. The use of a generator tank is highly recommended to control and maintain the metal at optimal levels. If a generator tank is not used, the zinc anodes must by partially or entirely removed from the plating tank during an extended bath shut-down to stop zinc metal build-up.

Literature and technical information on zinc generator tanks can be obtained by contacting a technical representative at Columbia Chemical Corp.

OPERATING TEMPERATURE

The preferred temperature range for COLZINC ACF-II is 75° - 95° F (24º - 35º C) with an overall operating range of 65° - 125° F (18º - 52º C). Optimum plating speed, covering power, throwing power, bath conductivity and brightness can be achieved in this preferred range. High temperatures cause excessive brightener consumption, loss of brightness in the low current densities and poor covering and throwing power. Low temperatures cause a loss of plating efficiency.

HULL CELL EVALUATION

The plating bath should be checked daily by running non-agitated 3 ampere-3 minute and 1 ampere-5-minute Hull Cell panels (steel or zinc anodes can be used). Use a COLZINC ACF-II Trouble Shooting Guide as a helpful tool for Hull Cell panel problem solving.

PLATE DISTRIBUTION TEST FOR USE AS A GUIDE TO HELP DETERMINE THE COLZINC ACF-II CONTENT

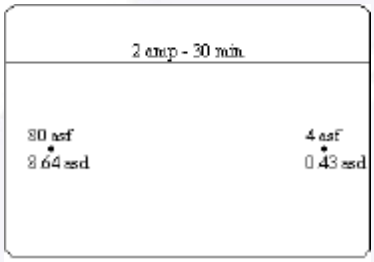
1. Run a non-agitated 2 ampere-30-minute Hull Cell panel using a steel anode. The solution should be maintained as close as possible to the working bath temperature

2. Rinse the Hull Cell panel under cold water and dry. Do not dip in a nitric or chromate solution

3. Using a Hull Cell ruler, take thickness readings at 4 ASF (0.43 ASD) and 80 ASF (8.64 ASD). See diagram below

4. Calculate the high to low current density thickness ratio by dividing the thickness of the H.C.D. reading (80 ASF/8.64 ASD) by the L.C.D. reading (4 ASF/0.43 ASD)

The optimum thickness ratio is 1.5 to 2.25. A thickness ratio above 2.25 is an indication of low brightener. A thickness ratio below 1.5 is an indication of high brightener content. This test should be used as a simple tool for evaluating the level of brightener relative to the zinc metal. Caustic soda content, chromium contamination, bath temperature, poor filtration, COLZINC ACF PURIFIER overload, and organic contaminants will affect this test.



CONVERSION OF EXISTING SOLUTIONS

Most conversions of competitive processes are compatible with COLZINC ACF-II addition agents and proceed as follows:

1. Stop all competitive proprietary addition agents
2. Add 0.1% to 0.5% COLZINC ACF-II
3. Add 0.025% to 0.05% COLZINC ACF PURIFIER
4. Add 0.025% COLGLO LCD BOOSTER
5. Slowly adjust bath chemistry if necessary

The following Hull Cell tests should be performed on the plating solution prior to all conversions:

1. Add 1.5 ml. COLZINC ACF-II to the Hull Cell in increments of 0.25 ml
2. Compare 1 ampere-5 minute and 3 ampere-3-minute Hull cell panels with the “as is” panels
3. Check for signs of incompatibility such as striations, bands, clouds or a mottled deposit
4. Determine optimum charge of COLZINC ACF-II
5. Repeat 1 ampere-5 minute and 3 ampere-3-minute Hull Cell using the predetermined optimum charge of COLZINC ACF-II with additions of 0.025% to 0.1% COLZINC ACF PURIFIER and COLGLO LCD BOOSTER
6. Determine optimum charge of COLZINC ACF PURIFIER and COLGLO LCD BOOSTER

HANDLING & STORAGE

Columbia Chemical recommends referring to the specific product Safety Data Sheets for safety, handling, and storage precautions.

NON-WARRANTY

The data contained in this bulletin is believed by Columbia Chemical Corp. to be accurate, true, and complete. Since, however, final methods of use of this product are in the hands of the end-user and beyond our control, we cannot guarantee that the end-user will obtain the results described in this bulletin, nor can we assume responsibility of the use of this product by the end-user in any process which may infringe the patents of third parties.