PATEL CHEMICALS TECHNICAL DATA SHEET

UNISTAR ZINC BRIGHTNER

UNISTAR ZINC BRIGHTNER solution produce extremely bright, fine grained and lustrous zinc deposits over a wide current density range in both vat and barrel plating operations.

The Growel research team has developed and entirely new brightener system after completely reformulating the previous product. The new **UNISTAR ZINC BRIGHTNER** has been tested extensively not only at our Pilot Plant and Laboratory, but also at the premises of some of the biggest consumers of Zinc Brightens in India. These trials, in manual and automatic plants, using vats and barrels have proved beyond doubt the amazing versatility and stability of **UNISTAR ZINC BRIGHTNER** process.

INTRODUCTION
Mirror bright bluish chrome-like deposits are obtained with **UNISTAR ZINC BRIGHTNER** Brightener after passivatio It can be used in baths with temperature ranging from 25℃ - 35℃ in both, vat and barrel plating operations. Its exceptional throwing power and superbly balanced constituents produce uniformly bright deposits even in deep recesses of components. Its high tolerance to metallic impurities, and remarkable stability in the bath results in exceedingly low operating costs by minimizing the additions of UNISTAR ZINC PURIFIER and brightener. Even when the bath has not been used for long periods, only small additions of brightner are necessary. The throwing power and covering qualities are not affected even by higher additions of brightener than recommended.

MAKE UP :

The solution is made up by dissolving **UNISTAR ZINC BRIGHTNER** Salt in suitable water in the following proportions:

UNISTAR ZINC SALT : 200 g/l
UNISTAR ZINC BRIGHTNER : 4 - 5 g/l
UNISTAR ZINC PURIFIER : 5 cc/l

	VAT		**BARREL**	
	Range	**Optimum**	**Range**	**Optimum**
Cathode Current Density A/dm	1.5 - 4.0	2.5	1.0 - 2.0	1.0
Bath Voltage (in volts)	2 - 6	3.5	12 - 16	14
Temperature	20 - 50℃	25℃	20- 50℃	25℃
Filtration		Periodic		Periodic
Fume Extraction	Recommended		Recommended	

Agitation Cathode movement ...

MAINTENANCE :

The bath solution should be analysed periodically and additions should be made to balance the constituents within the following limits.

Zinc metal	30 - 33 g/l
Sodium Cyanide	80 - 90 g/l
Caustic Soda	70 - 80 g/l

The cathode efficiency of Cyanide Zinc solution increases as the metal content increases, provided all the other operating conditions remain constant. This difference in cathode efficiency between density of 2.0 A/dm_2 g/l Zinc Metal and one containing 40 g/l is more pronounced above a current density of 2.0 A/dm_2 However, the high zinc metal content shifts the bright plating range to the high current density end. Zinc Metal content lower than 25 g/l in the bath will result in poor cathode efficiency and excessive gassing.

RATIO OF TOTAL SODIUM CYANIDE TO ZINC :

The above ratio is most important to obtain a good performance from the bath with regard to cathode efficiency, throwing / covering power and bright current density range. A higher ratio gives better brightness at the low current density range and vice versa. The ratio should values may vary slightly from one bath to another, the following table will serve as a guide to appropriate ratios which are used at various temperature ranges.

Temperatures	**Total NaCN**	**Zn Ratio**
20 - 25℃	2.5 - 2.7	1.0
25 - 30℃	2.7 - 2.9	1.0
30 - 35°	2.8 - 3.0	1.0
35 - 40℃	3.0 - 3.2	1.0
40 - 45℃	3.1 - 3.2	1.0
45 - 50℃	3.3 - 3.5	1.0

A) Low NaCN : Zn Ratio results in :

a. High Brightener consumption
b. Low tolerance to elevated temperatures
c. Difficulty in maintenance due to regarded dissoolved of Zinc Anodes.

CAUSTIC SODA

The concentration of Caustic Soda is very important in obtaining high cathode efficiency, throwing covering power. Optimum concentration should be 2-3 times the zinc metal content. However, a high caustic soda content is generally used for the plating of deeply recessed parts and for hardened steel parts because of the increased covering power obtained. High caustic soda content increases the brightner consumption, reduces tolerance to elevated temperatures, increases purifier consumption and creates maintenance problems due to rapid dissolution of the zinc anodes.

SODIUM CARBONATE

Carbonates are formed by chemical decomposition and absorption of carbon dioxide from the air. They form more rapidly when solutions are operated at high temperatures and with vigorous agitation. Excessive amounts of carbonate have the effect of lowering the bright plating range and decreasing

cathode efficiency.

TEMPERATURE

Solution temperature is exceedingly important in obtaining high quality work from zinc plating baths. The best operating temperature is between 25-35℃ Temperatures below 25℃ decreases the conductivity and dullness appears at the high C.D. range. The brightner is effective upto 50℃ but the following is usually observed when cyandie zinc baths are operated at high temperatures.

1. High consumption of sodium cyanide
2. High consumption of brightener
3. Shifting of bright plating range to high current density range
4. Rapid build up of sodium carbonate

UNISTAR ZINC SALT

The constituents are thoroughly blended from selected raw materials in correct proportions to give satisfactory results without treatment.

UNISTAR ZINC BRIGHTNER

Only UNISTAR ZINC BRIGHTNER is required for make-up and maintenance UNISTAR ZINC BRIGHTNER being a liquid can be conveniently added to the plating bath. Additions are directly to the plating bath without dilution UNISTAR ZINC BRIGHTNER is stable in the bath during both operation and idling times. It is advisable to add Brightner after each charge as this will assist in obtaining uniform results. To minimise the consumption of Brightner, it should be added 10 minutes before completion of plating time. For maintenance, additions of 150-200 cc per 1000 ampere hours for vat plating and 200 - 250 cc per 1000 ampere hours for barrel plating are normally required if the baths are operated between 30 to 45℃. However, as explained earlier the consumption to Brightner depends on the solution composition, operating temperatures, degree of brightness and purity of solution.

UNISTAR ZINC PURIFIER

This purifier is used to remove heavy metallic impurities. The concentration of Monicol in the bath should be maintained by testing the solution with lead acetate paper. A light brown colour should be maintained by adding monicol, when required. For heavy copper contamination, the solution should not be left in the solution for more than 2 hours as it will dissolve together with the copper, thus nullifying the latter. Alternatively, low current density electrolysis (0.5 A/Sq.ft.) should be carried out to remove metallic impurities.

SOLUTION PREPARATION

Clan the plating or mixing tank thoroughly and fill half the tank with suitable water. If the tank is rubber lined, it should be leached with 1% Caustic Soda and a wetting agent to remove sulphur. It should then be thoroughly cleaned with cold water. Add the required quantity of salt gradually and keep stirring the solution until the salts are completely dissolved. Then add 5 cc/l UNISTAR ZINC PURFIERI so as to remove heavy metallic impurities and stir the solution to settle overnight. Next morning filter the solution to remove precipitated impurities and after this add water to make up the level. Then add UNISTAR ZINC BRIGHTNER and mix the solution well. It is now ready for use.

EQUIPMENT

Zinc plating Tank : A mild steel tank lined with hard rubber or P.V.C. is recommended and to obtain consistently good results by controlling the temperature, especially in large vat and barrel installation, it is advisable to provide cooling coils inside the tank.

OTHER UNITS

Periodic filtration is recommended to remove suspended impurities from the solution so as to get better
results.

FUME EXTRACTION

For large scale operations and when the bath is operated at high current densities a suitable fume extraction hood, ducting, and exhaust fan must be fitted to the tank
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ANODES

Pure zinc of 99.5% purity should be used. The surface areas of anodes should be about 3/4 of the total area of the work to be plated. ANODES SHOULD BE REMOVED FROM THE BATH DURING IDLE PERIODS.

BARREL PLATING

Submerged Barrels - These are made of acrylic / polypropylene sheets and the unit is fitted with a geared motor to rotate the barrel in the plating tank. The volume of plating solution should be as high as possible in barrel plating tanks and it should not be less than 1:5 litres/ampere of current employed.
CONVERSION OF EXISTING ZINC SOLUTION TO THE UNISTAR ZINC BRIGHTNER PROCESS
The conversion can be easily carried out by adjusting zinc metal, cyanide and caustic soda contact and adding UNISTAR ZINC PURIFIERP and Brightner. However before such a conversion a sample should be submitted to G&W laboratory for necessary recommendations.

ANALYTICAL CONTROL PROCESS

(For Cyanide Zinc Plating Solution)
NOTE : Please use safety pump while pipetting cyanide solution :

1. Estimation of Zinc Metal

Pipette 2 ml of plating solution into a 500 ml Conical flask. Dilute with small quantity of distilled water. Add about 2 gms. of ammonium chloride, 5 to 10 ml or ammonium hydroxide solution, a pinch of Eriochrome Black indictor and about 2 gms of Chloral hydrate. Shake well and titrate agaisnt 0.1 M E.D.T.A. taken in the burette.

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