PLATING RESOURCES, INC.

"Surface Finishing Technology"

Dura-3000
High Efficiency
Hard Chrome Process

Description

Dura-3000 is a State-Of-The-Art process for High Speed & High Efficiency plating. It performs equally well for flash deposits or heavy build-up work on either ID or OD applications. Dura-3000 provides faster plating speeds and improves deposit properties like hardness, corrosion resistance, crack structure and wearability.

The Dura-3000 bath plates at 35 % efficiency.
Standard baths are limited to about 15% and other high-speed baths to about 25% efficiency.

The process is very user friendly, easy to control and inexpensive to operate.

- **50% Faster Plating Speeds (1.2-1.3 mils/hr. at 2 ASI).**
- **Extremely Smooth & Very Bright Deposits.**
- **Buffers The Bath For Reduced Pitting & Noduling.**
- **72-74RC Hardness, Better Micro-Cracks & Longer Wear Life.**
- **Maintains Plating Speed Even As Impurities Increase.**
- **Anodes Stay Active & Last Longer.**
- **Avoids Barium Treatments From Sulfate Break-Down.**
- **Non-Etching In Unplated & Low Current Areas.**
- **Used With Inexpensive Generic Chromic Acid.**

Plating Speeds

The high efficiency of this bath provides an approximate 50% increase in plating speed. Typical deposition rates for relatively clean baths are:

2 ASI 0.00125"/hour
3 ASI 0.00188"
4 ASI 0.00250"

This bath is much more resistant to impurities like trivalent, copper and iron than other high efficiency baths are. As such, the plating speed doesn't slow down as much or as fast. Baths with extreme impurity levels, however, will likely be around 0.0002"/hour slower than the ideal rate, depending on the voltage or current density used.

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Bath Control

This bath can be used with chromic acid levels of 20 - 50 oz/gallon and sulfate ratios of 80-140:1. The best throwing power is achieved at a 120:1 ratio. Typical impurities such as trivalent, iron, copper and chloride should be kept within the recommended range for best bath performance. CR-3 Reducer is effective for controlling impurities.

Item	Optimum	Range
Chromic Acid	30.0 oz/gal.	20 - 50
Sulfate	0.25 oz/gal.	(by ratio)
Ratio	120:1	80 - 140:1
Dura-3000 & 3500	(see below)	
Trivalent Cr	1 % of chromic acid	0.5 - 2.50 %
Metallic Contaminants	< 5.0 g/l	
Chloride	< 20 ppm	
Insoluble's	< 0.04 g/l	
Temperature - F	140	130 - 150
Current Density	2.0 ASI	1 - 10 ASI

(Convert oz/gal to g/l by multiplying by 7.48915)

Bath Additives

This bath uses either the Dura-3000 Additive or Dura-3500 Booster for conversions and maintenance, depending upon the bath type. These are best controlled by periodic analysis, but can also controlled by the plating speeds obtained.

Dura-3500 Booster

This powdered additive is used to convert new baths and standard 100:1 baths to High Speed High Efficiency usage. Dura-3500 Booster provides a drastic improvement in bath performance and plating speed. Do not add Dura-3500 Booster while plating; always add it when the tank is empty of work. Sprinkle the addition evenly into a hot bath and agitate until fully dissolved.

The Dura-3500 Booster is basically a one-time addition that's used for the initial conversion. But, because of variances in anode ratios, current densities and amps. per bath gallon, an occasional small addition of the Dura-3500 Booster may be occasionally needed. We suggest that you have the Dura-3500 level tested annually.

One caution

Do not add Dura-3500 Booster to baths that plate parts with highly stressed base metals or those with surface hardness exceeding 45 RC, without first stress relieving the parts by baking and then shot peening; see QQ-C-320. This is especially important for deposits thicker than 0.001" because the base metal stress can transfer to the chrome deposit causing out-gassing, macro-cracking, and in some cases, a loss of adhesion, especially after any abusive post-plate grinding.

The only downside for not using Dura-3500 in these baths is a slightly slower plating speed. You should, however, still use the Dura-3000 Additive.

Dura-3000 Additive
This liquid additive is used to convert other high efficiency baths. It's also used in all baths for maintenance once it has been converted. It's important to maintain Dura-3000 additions, either by amp. hours or whenever chromic acid is added; see below.

Bath Conversions

Conversions to this process is easy and inexpensive.

Standard Baths
These baths are converted by simply adding 2.5 oz/gal. of the Dura-3500 Booster, and a small amount of Dura-3000 Supplement Additive which is provided free of charge.

High Efficiency Baths (others)
These baths are converted by adding 3% by volume of Dura-3000 liquid. The Dura-3500 Booster is not normally needed, unless the catalyst level is low.

High Fluoride Baths
High fluoride baths should not be converted to this process until the fluoride has been consumed.

Bath Maintenance

As with any hard chrome process, the bath should be tested for chromic acid, sulfate and impurity levels on a regular basis; the frequency is based on maintaining them within acceptable limits. If needed, Plating Resources, Inc. laboratory can provide this service along with recommendations and guidance for controlling bath impurities.

Dura-3000 Liquid Additive is added to maintain the Booster level in the bath.

These additions can be based on either ampere hours or chromic acid consumption. Regular additions of Dura-3000 will eliminate variances in plating speed and provide for more consistent deposit quality. The maintenance addition rate should be:

1/4 gallon	per	100,000 ampere hours plated, or
1 gallon	per	100 pounds of chromic acid consumed.

Anodes

The typical stick or conforming type anodes for conventional hard chrome are used with this process. Either 6% antimony-lead or 7% tin-lead can be used depending on the desired life and rigidity needed.

Equipment

The equipment normally used for hard chrome plating is satisfactory for the Dura-3000 process. Typical tank linings like PVC, Koroseal or molded HD polyethylene are best. While lead linings can also be used they are not recommended due to their conductivity. The rectifier(s) can be the typical SCR type (or other control types) and should have sufficient amperage capacity at up to 9-12 volts, with a maximum of 5% ripple at the actual voltage used. This slightly higher voltage can be beneficial when contaminants build-up. The tank should be ventilated and PVC systems are commonly used. The heating and cooling systems should be of either titanium or Teflon construction with controls to maintain the desired bath temperature. Mild air agitation is desirable for mixing in chemical additions and avoiding temperature stratification in deep tanks. The air agitation should be provided by a low-pressure blower and controlled to avoid excess chrome mist. Pumps, filters and plumbing should be schedule 80 CPVC with glued fittings.

Bath Impurities

Bath impurities should be kept as low as possible for best results. Of particular concern is trivalent, copper and iron. High impurity levels require additional voltage to maintain the desired current density with a greater tendency for burning, pitting and a reduction in throwing power. The best removal method for trivalent and chloride is to dummy the bath using CR-3 Reducer and an anode ratio of at least 20:1. Porous pots used with CR-3 Reducer can be used to remove copper and iron; this process can be slow if the levels are high though. Dura-76 is helpful in overcoming the effect of bath impurities by buffering and chelation.

Analytical Control

The Dura bath should be analyzed on a regular basis for chromic acid and sulfate. Make additions as needed to maintain the desired concentrations. The recommended frequency depends on the tank volume and the work load; most shops do this weekly. Bath samples can be sent to Plating Resources, Inc. on a monthly basis for a detailed analysis at nominal cost. This service can be used as either the primary control or as a back-up for your in-house tests. We can also provide analysis of the Dura Additive without cost at any time.

Regulations

Like all chrome plating solutions, the Dura bath produces misting and this can be reduced if lower chrome levels are used. This mist contains Cr(VI) which is regulated by the EPA for environmental and OSHA for worker safety issues. Be sure to follow all federal, state and local regulations for safe operation and hazardous disposal.

Caution

The Dura bath contains chromic acid, sulfuric acid and the various Dura additives outlined above. These are all industrial chemicals and must be handled carefully and in accordance with the directives provided in the individual SDS forms.

Read and understand the SDS on all of these chemicals before handling or using. Ensure that all regulatory standards are followed and limit personal exposure as required for Cr(VI) by OSHA.

Avoid personal contact with these chemicals, avoid splashing and avoid breathing any fumes released during operation. Do not inhale any dust, mist or vapors from these chemicals. Do not allow these products to contact the skin or eyes. In case of contact, flush immediately with large amounts of fresh water and seek immediate medical attention.

Wear protective clothing such as aprons, gloves, face masks and respirators. Be sure that adequate eyewashes and emergency showers are available nearby before handling or using any of these chemicals.

Designated work clothing should be worn while using these chemicals and the worker(s) should thoroughly shower and change into fresh-clean street clothing before going home. Decontaminate all work clothing before reuse.

The user is responsible for providing adequate work clothing, personal protection, limiting personal exposure, and providing any required clean-up, decontamination as well as any needed medical attention.