Finisher's Think Tank



Stephen F. Rudy, CEF Enequist Chemical Co. 100 Varick Avenue Brooklyn, NY 11237 718/497-1200 E-mail: sfrudy@aol.com

Trivalent Chromates Boosting Systems & Compliance

Last month this column highlighted improvements to surface preparation. These benefits are also meant to meet new compliance mandates and tighter finishing limitations. Along this line, let us check into trivalent chromates.

Many of us are aware of just how important trivalent chromates have become. They have developed into what could be referred to as a "just in time" replacement to hexavalent chromates. Recent developments in metal finishing have energized this movement. In fact, platers may not so much be "itching to switch" to trivalent, as acknowledging a sure bet to boost systems and compliance.

Used - Rebuilt - New Rectifiers Huge comprehensive pricelist

www.drrectifier.com Free rectifier help and more!

\$175 Amp Hour Meters

JP Tech Amp/Hour meters offer an extensive feature set, unsurpassed reliability and economy. The dual peristaltic pump model includes everything necessary to start chemical adds immediately.

Amp/Hour Systems \$175.00 Totalizer Systems \$300.00 Pump Controller Systems \$575.00 Pump Controller Systems w/2 pumps Check out our Ph/ORP meters

JP Tech, Inc. ain Street • P.O. Box 863 East Troy •

2920 Main Street • P.O. Box 863 East Troy • WI 53120 Phone: 262-642-7671 • Fax: 262-642-7681 e-mail: sales@jptechinc.com www.jptechinc.com

Free Details: Circle 110 or visit www.aesf.org

How it Began

Where and when did this begin? Is there a timetable? The facts are straightforward and moving in rapid progression.

A few years ago, the European Union (EU) became concerned with recycling materials and landfilling scrap. Several chemical materials of construction and metal finishes came under scrutiny. Among these is hexavalent chromium. To head off any perceived future earth and water contamination, mandates were placed on phasing out hexavalent chromium and the other targeted materials. In fact the End of Life Vehicle, commonly referred to as ELV, concerning hexavalent chromium, became enforceable on July 1, 2003. ELV clearly restricts the application of no more than 0.1% of hexavalent chromium in corrosion preventing coatings on materials as of July 1, 2007. Hexavalent chromium is only applied to avoid corrosion of plated parts.

For metal finishers, the positive development is that trivalent chromates have been in commercial use for over two decades. Or specifically, the blue bright (clear) process. It passes the common ASTM B-633 Type II and several other specifications. Similarly to it's hexavalent predecessor, the trivalent chromate:

- Provides a mechanical barrier of corrosion fighting chromium
- Self healing characteristics
- Relatively low abrasion resistance
- Cold forming
- Compatible with organic top coats (lacquers, silicates, powder coats, etc.)
- Relatively constant surface conductivity
- Good solderability

NSS (neutral salt spray) for the trivalent blue chromate is also equivalent to the hexavalent type: 20–24 hours. This increases to over 100 hours with application of an appropriate top coat. Protection is based on an initial zinc deposit thickness of 0.0003 inches.

Trivalent chromated parts can be baked at 400°F (204°C) for one hour without any effect on color or corrosion resistance. The blue color or depth of some trivalent chromates is accentuated by post process heating or baking.

Why Change?

Getting back to hexavalent chromium, it's toxicity has been a driving force for an alternate process. This must have also been a driving force for the EU to initiate changes. Issues associated with hexavalent chromium include:

- Compounds listed as carcinogenic by IARC and NTP
- Serious concerns to drastically lower the chrome PEL

Finishers and suppliers have a vested interest in the outcome of chrome emission standards. How is one to compliantly handle and blend hexavalent chromium containing products. How is the other to compliantly handle and apply these products. The one key to getting the job done has been the satisfactory use of trivalent chromium compounds. Are you aware of these facts concerning trivalent chromium compounds?

- Many of the compounds are non-regulated per hazard class or division
- They are not listed as carcinogens by NTP, IARC, and OSHA

Did you know these facts about trivalent chromium?

- It is the most common form of ionized chromium in nature
- The harmful effects of chromium are attributed to the hexavalent form

• The passage of trivalent chromium through cell membranes is inhibited. Hexavalent chromium is not.

Many of us start or maintain our day ingesting a multivitamin. Read the label. It probably states "contains trivalent chromium." It's a necessary nutrient for proper body function. However, if you do not take a multivitamin, a proper daily diet allows the intake of 0.03-0.1 milligram of trivalent chromium per day from various food sources.

What Makes Them Different?

What makes trivalent blue chromates different from their hexavalent counterparts? The following examples are given:

- Product concentrates are typically purple colored liquids
- Working bath pH range may be 1.8–2.5
- Fluorides are optional
- Biodegradable
- Not affected by water hardness

Typical operating standards for rack and barrel:

- 3-6% by volume
- 70-85 deg F (21-29 degC)
- 30-60 seconds immersion
- Filtration is recommended

The operating parameters are equivalent for chloride, alkaline, and cyanide zinc.

Trivalent chromating solutions are less aggressive than the hexavalent type. Since the polishing action and film formation is slower, there is less etching and dissolution of the zinc deposit. This results in less zinc removal from thin deposit areas (such as recesses), thus enhancing corrosion protection. Less zinc in solution also lends to extending the service life of the trivalent chromate bath. For example, a hexavalent chromate bath in continual use may require dumping once every 24 hours to maintain ASTM B-633 Type II specification. For the same requirements, a trivalent bath may only need changing once every 3-5 days. The actual respective bath life is based on operating parameters, drag-in/ drag-out, and surface areas to chromate. In the majority of field applications, trivalent chromate baths, as a general observation, do surpass the service life of hexavalent baths by at least 2:1. When dumping a trivalent chromate bath, handling and waste treatment is much simpler. Because the chrome is already trivalent, alkaline precipitation with caustic or lime is the only requirement.

Trivalent blue chromates offer many advantages to boost performance, application, and safety. They can readily meet the requirements mandated by the EU and ELV. All this is not lost on the fact that trivalent chromates also offer a suitable alternative for RoHs compliance. Trivalent chromates are certainly on target to boost systems and compliance. *P&SF*

Do You Have a Question For a *P&SF* Columnist?

Write, FAX, or e-mail your questions to:

Plating & Surface Finishing 3660 Maguire Blvd., Suite 250 Orlando, FL 32803-3075

FAX: 407-281-6446

E-mail: editor@aesf.org

America's Top Finishers Use Quality Heatbath Products

Nitec Electroless Nickel:

Low Phos for high "as deposited" hardness; Mid-Phos for lowest cost per ml/sq.ft. Hi-Phos for maximum corrosion protection. Exceptional uniformity, greatest economy!







mfsa 🍕

Pentrate Ultra: k oxide! Won't rub off;

Industry's *blackest* black oxide! Won't rub off; deep black finish is predictable and uniform – no off-color films! Best black oxide – hot or cold. Inexpensive, low dragout.

Phos Dip 1263:

Zinc phosphate conversion coating produces maximum coating weights, minimum sludge Easily meets automotive and MIL specs exceptionally stable

Lustra-Zinc

Produces brilliant, high-luster zinc plate. Highly consistent results, long bath life. Reduces waste and chemical costs. Wide plating range eliminates burning.



Free Details: Circle 111 or visit www.aesf.org