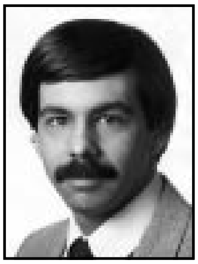

Finishers' Think Tank

Marty Borruso
26 Flagship Circle
Staten Island, NY 10309
Phone: 1-500/FINISH1
Internet: dpjh50a@prodigy.com

Have a problem on the finishing line? To send your question, use the convenient, postpaid form on our Readers' Service Card, or send a letter to: "Finishers' Think Tank," 12644 Research Pkwy., Orlando, FL 32826-3298.

Trivalent Chromates Vs. Hexavalent Systems

Q. **We are plating cap-like parts in cyanide zinc and a trivalent blue-bright chromate. Since we changed to trivalent chromates, our customer has had a problem getting a heat-cured epoxy glue to adhere to its final product. Are the properties of the trivalent chromate different from the hexavalent systems we had used successfully in the past?**

A. Trivalent chromates do not provide the same type of coating as typical hexavalent chromates, and the trivalent blue systems do not build to the same thickness. Chromates from hexavalent systems form an emulsion on the surface of the zinc deposit, which protects the surface from attack by atmospheric conditions. The thickness of that emulsion is evidenced by the color of the chromate, and virtually all darker-colored chromates are thicker. As the chromate cures, moisture is removed from the surface, which creates a texture to the surface. That texture allows subsequent coatings to be applied and adhesion obtained. The mechanism is similar to that of a lock and key, so that the subsequent coating sticks soundly to the surface.

In contrast, a trivalent chromate does not form the same type of emulsion on the surface; therefore, the coating is much thinner. Trivalent chromates, however, protect more by the passivation of the surface than from the formation of a true chromate emulsion on the parts. It is because of this fact that they do not protect as well and do not form as sound a bond with paints or glues that are applied to the parts after processing. The older the chromate, the thinner the film will become, and the more difficult it will be to apply sound secondary organic coatings. One strategy may be to reduce the time between coating and applying glue to the deposits—close monitoring may produce success.

It is important to note that each coating must be selected according to what is required for the end product. For your particular customer, it may be necessary to continue using hexavalent systems to achieve the correct coating prior to the application of the glue—one that will allow for the best adhesion of the heat-cured epoxy glue.

Latent Blisters on Aluminum

Q. **We are working with extruded aluminum housings that have deep recesses and intricate channels machined in them. The parts are plated with an aluminum copper strike, and then receive a minimum of 200 microinches of copper from a pyrophosphate copper plating solution. The parts are fully inspected and look good when they leave our plant, but after a month they come back with huge blisters. How can we prevent this?**

A. The problem of latent blisters on aluminum is not rare and can be eliminated with some good plating practices. The fact that these blisters are appearing a month later indicates a problem in your processing cycle somewhere in the preparation phase. Changes in the pre-plate cycle could be the answer. (The use of electroless nickel would simplify the process, but your letter noted that it is prohibited by your customer.)

The failure can be traced back to the fact that parts being processed are immersed in highly aggressive alkaline cleaners, etches, zincates, and both copper strike and plate. The alkalinity makes changes in the aluminum surface that may not be noticed immediately. When alkaline preparation materials are used, they may not only attack the surface of the part, but may also be retained in porosity in the aluminum surface and in the etched surface that is imparted. To avoid this, it may be necessary to process the parts with only mildly alkaline materials and acid etches.

Another suggestion is to use a modified alloy zincate, which is more resistant to subsequent plating operations than straight zincate systems. This resistance to subsequent deposits is key—if the zincate used is subject to attack by the plating solution, it can cause latent blisters.

A recommended cycle would be:

- Soak clean in a non-etch cleaner
- Rinse
- Rinse
- Etch in 20% phosphoric acid with 4 oz/gal ammonium bifluoride
- Rinse
- Rinse
- Zincate with a modified alloy zincate
- Rinse
- Rinse
- Copper strike with cyanide copper at pH 10, with virtually no free cyanide at about 120 °F

Note: You must operate with very low free cyanide in the copper, because it is the cyanide that attacks the zincate and causes latent blisters. *P&SF*