P&SF Retrospective

Originally contributed by Ronald Kornosky
Compiled by Dr. James H. Lindsay

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Anodes for gold

Q: Can platinized titanium anodes be used in alkaline gold baths?

A: Platinized titanium anodes can be used, but the cost would be much more than for stainless steel. If you were using an acid gold bath, platinized titanium would be preferred because stainless steel can dissolve slowly in acid solutions containing certain chelates.

Other insoluble anodes that can be used in alkaline cyanide gold plating include "Nichrome" (a nickel-chromium alloy) and hard carbon. However, the latter could result in blackening of the solution if carbon comes off the anode, requiring bath filtration. With all insoluble anodes, of course, gold has to be replenished with additions of gold cyanide salts.

If the investment in gold is not excessive, you could use soluble, high-purity, rolled-gold anodes in a typical alkaline bath. If impurities (other metals) that might induce passivity are carefully monitored, there should be no problem. But, because gold inventory costs are often a strong consideration in anode selection, stainless steel is usually preferred.

Electroless nickel turns black

Q: We are plating steel parts with electroless nickel / 7% phosphorus. Threaded holes are masked during plating. The masking is then removed and the parts are manganese phosphated. At this stage, the EN sometimes turns black in spots. The stains appear randomly and cannot be removed with chromic or hydrochloric acid, which should readily dissolve the phosphate coating. Any suggestions?

A: After our discussion, I believe we can rule out contamination as a result of the stopoff, as this problem occurs on parts that have not been masked. Norman Nicholson of Parker Chemical Co., Madison Heights, Ml, suggests that the manganese phosphate treatment is rather aggressive and that your EN deposit might be too thin, even though the parts may look good. Increasing the thickness will show if this is true.

Trial and error with a different EN bath may also alleviate the problem. In fact, Konrad Parker, a consultant in Park Ridge, IL, says that sulfur from the stabilizer in the EN bath may be codepositing. Comments Mr. Parker, "I've run into this blackening problem on occasion, especially after the part is allowed to stand overnight following plating. Sulfur from the stabilizer can codeposit, causing sulfides and discoloration. I have switched to a non-sulfur-stabilized bath when I've come up against the problem."

Nickel tarnish

Q: A customer recently sent back some work that we barrel plated with nickel. He claims the parts turned brown, but they were not that color when plated. Can you shed any light on this?

A: Any unalloyed nickel deposit from any bath can tarnish. If the deposit is thick enough to prevent substrate corrosion, the parts can be lacquered or dipped in water-soluble polymers or a wax/polymer mixture to inhibit tarnishing.

Stains on bronze

Q: Please note the light surface tarnish that appears on our zinc die castings plated with copper, nickel and bronze. Before plating, we first vibratory finish to deflash, then use a 180-grit belt. The stain appears about 70% of the time and is first noticed after the final hot rinse in deionized water. A 160°F anti-tarnish chromate solution does not help. Our brass-plated parts go through the same cycle but have never shown this problem. What could be causing it?

A: Many such tarnishing problems are caused by chemical entrapment in substrate pores, which may be exposed as the die casting is polished. For instance, the 180-grit belt you mention may be too coarse for this application. A 240- or 320-grit greased belt is preferred for deburring, followed by vibratory finishing to produce a smooth surface. Vibratory finishing will often peen over pores that are exposed by belting at part lines if the pores are not too large. You should be using vibratory finishing after belting the deflashed edges. Much of the staining on the parts you forwarded occurs at areas adjacent to an edge.

I am not familiar with the anti-tarnish chromate you mention, but my first impression is that a properly passivated bronze surface should resist tarnishing. The common chromate types, with and without current, have always worked for us.

You also say there is no problem with parts on the brass plating line, which implies that the surface preparation is okay but that something is wrong with the bronze bath you're using. For a lab investigation, we sent your sample to Walter Pike of M&T Chemicals, Rahway, NJ. "The bronze-plated part does not appear to have a cyanide bleedout stain," says Mr. Pike. "It appears that additives are codepositing a compound (probably a sulfur type) and making the surface extremely active and subject to staining, which worsens with increasing temperature and drying. The bath may need carbon treatment to remove excess additives. In addition, a cathodic electrocleaner following bronze plating, then a cold water rinse, should remove the codeposited organic film."

Poor anodizing contact

Q: We are anodizing aluminum, then using a black dye for final coloring. Some parts are jet black, but occasionally others come out with a blue cast. What's happening?

A: Electrical contact could very well be causing this problem. First, note which racks and tips correspond to the problem areas and mark them. My bet is that the blue cast will reproduce at the same locations. Contact pressure or the connection between the tip and the spline is probably not good. This will result in a very thin aluminum oxide film that does not dye well. Check the thickness on the rejects, too, to confirm this.

Reader replies

In "Finishers' Think Tank" [reprinted in the October 2007 issue from March 1984 - *Ed.]*, a reply was given regarding rapid formation of sludge in a brass plating solution. I do not agree with the answer.

I have seen this condition many times. The sludge is a white-to-gray fine solid and consists of zinc ferrocyanide. The low pH discussed is a strong contributing factor in the formation of the sludge because iron from tank walls or anode containers dissolves to form ferrocyanide, which precipitates with zinc. This sludge dissolves in high levels of cyanide but, of course, the solution stops plating. Presence of chloride greater than 1 g/L also contributes to the dissolution of the iron. Chloride can be dragged in from hydrochloric acid dips. Also, the HCl drag-in may bring in iron, which is dissolved in the HCI, then converted to ferro-cyanide. Higher pH tends to slow down the dissolution of iron in the cyanide solution. Carbonates are incorrectly blamed for many brass plating problems. *- Henry Strow, Oxyphen Products Co., Oakville, CT; member, AES Waterbury Branch.* ***P&SF***

The edited preceding article is based on material compiled by Mr. Ronald Kornosky, then of Hager Hinge Co., in Montgomery, AL, as part of the Finishers Think Tank series, which began its long run in this journal 26 years ago. It dealt with everyday production plating problems, many of which are still encountered in the opening years of the 21st century. As we have often said, much has changed ... but not that much. The reader may benefit both from the information here and the historical perspective as well. For many, it is fascinating to see the analysis required to troubleshoot problems that might be second nature today. In some cases here, words were altered for context.