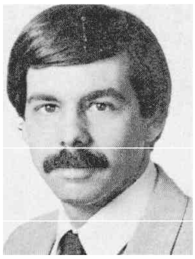
Finishers' Think Tank

By Marty Borruso



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Plating on Beryllium

Q. What surface treatments are appropriate for plating on beryllium?

A. Beryllium is a difficult metal to plate because of a naturally forming oxide film that is often both difficult to remove and quick to reform, upon contact with either air or water.

To prepare beryllium for surface finishing, you must remove the oxide film and replace it with another film that resists oxidation and will provide an adherent bond to both the substrate as well as the deposited coating. To remove the oxide film, the beryllium should be cleaned and etched in a solution of 45 percent HNO_3 and 3 percent HF at 100°F.

For good adhesion to the substrate, you must apply an adherent coating to the surface of the beryllium which resists oxidation. The most often used and easiest coating to handle is a zincate film. The zincate differs from others that are used on aluminum and should be operated between a pH greater than 3.0 and less than 9.5 for the best results. Alkaline aluminum zincates do not work well on beryllium and provide a loosely adherent film which will be of little or no use in processing.

Over the zincate it has been customary to employ a copper strike, but infinitely greater adhesion is gained by applying an alkaline electroless nickel to the surface. The use of the electroless nickel removes the zincate film from the surface and it will deposit nickel directly on the surface, eliminating the zincate layer and the corrosion caused by the undermining of the zincate layer. In addition, once the electroless nickel is deposited onto the parts, you may treat the parts as is common with plating on nickel.

Preventing Blistering

Q. I am finishing in acid copper bright nickel and gold, antimony lead castings. We sometimes see blistering of the deposit, and when the blisters are removed, you can see the base metal. What can we do to prevent this?

A. This is a recurring question in this column. I cringe when someone wants to plate over antimony-lead centrifugally cast parts. First, the parts are extremely porous and there is a problem with various mold release compounds that are used in the casting process. The mold releases run from simple talc to sophisticated silicone materials. A cycle which I have found successful is as follows:

. Soak clean in a heavily wetted soak cleaner with a relatively low pH and no free caustic. This will wet and remove the mold release material.

- Rinse well.
- Electroclean in a low pH electrocleaner.
- Acid pickle in a 20 to 50 percent solution of fluoroboric acid solution.
- Rinse very well.
- Cyanide dip in 4.0 oz/gal sodium cyanide with 2.0 oz/gal sodium carbonate.
- Copper strike with a mild high efficiency copper solution to a thickness of 0.3 roils (about 12 minutes).

Ž Rinse well.

- Acid copper plate to desired thickness
- Rinse well.
- Acid dip in 10 percent sulfuric acid.
- Nickel plate to desired thickness.
- Rinse well.

Ž Gold plate.

Ž Rinse well and dry.

The main problems to watch out for are a porosity in the deposit and the non-complete removal of the mold release materials from the surface of the parts.

Double lamination of the parts' surfaces is also atypical problem. This is evidenced by the separation of two layers of the part; the double lamination is usually caused by poor technique in casting the part. Most of the problems associated with finishing these types of castings are directly associated with the casting of the parts and of the quality of the material used to make the casting.

Finally, because of the porosity of the parts, solution tends to be held in the pores of the surface. When the part is completely coated, the coating may be undermined by the solution absorbed into the surface. As with any plating procedure, the proper preparation cycle will mean success or failure with the final finish.

Saving Gold

Q. What precautions and procedures may I follow to minimize the use of gold and meet the deposit thickness specifications?

A. To answer this question, I borrowed some information from Steve Schaffer at Lea Renal.

The first approach is a common sense one and you must determine what qualities of the deposit you are looking to maximize:

Ž The corrosion resistance/tarnish resistance.

Ž Hardness.

Ž Wearability.

- Solderability.
- Contact resistance.
- Freedom from porosity.

Ž High electrical conductivity.

Once you have determined what is necessary, you may also make a determination as to the alloy of gold which best suits the purpose. If you use 17 carat gold rather than a 23+

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carat gold, you will realize a 40 percent savings of gold deposit cost. You may also be able to use an alloy which maximizes the characteristics which you are seeking.

Aside from changing the alloy of gold you are using, you can look to institute a system of statistical process control to minimize the consumption of gold. Also the right parameters of operation with the right technique will improve plating distribution and minimize overplating of the parts.

These are just a few recommendations for reducing costs associated with gold plating, but as in any metal finishing exercise a good controlled analytical approach involving SPC, the right processes and procedures will minimize the cost and associated problems and maximize the throughput and quality. ❏