Finishers' Think Tank

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Have a problem on the finishing line? Please send your question to "Finishers' Think Tank," 12644 Research Pkwy., Orlando, FL 32826-3298; or e-mail to journal@aesf.org.

Filtration, Pore Size & Current Density

Q. How do filtration and pore size affect possible current density?

A. They don't—but they certainly affect the quality of the deposit. There may be some contaminants in the process system that are driven by current density, so are therefore attracted to the high-current areas of the processed parts. The effect of high-current densities at the limit or beyond the limit of the process chemistry will cause poor quality in terms of the functionality and the distribution of the deposit. The better the filtration, the smaller the possibility that impurities will affect the quality of the deposit. In an ideal world, plating solutions would have no undissolved materials included, so that the results from the process solution could always be predictable.

Deposition Rates

Q. Which copper and nickel baths permit the highest deposition rate?

A. For the highest level of efficiency and for general bright nickel plating tasks, a standard Watts nickel formulation is one of the best in terms of efficiency and effectiveness. (I use a formulation of 40 oz/gal nickel sulfate, 10–12 oz/gal nickel chloride and 7.0 oz/gal boric acid). The rate of deposit only represents the dwell time at which process parts remain in the plating solution. The real advantage is in determination of what is really important in terms of efficiency and the ability to uniformly deposit coatings so that the specification is met. Tank size is the least painful of all investments a plater can make. If the parts need to dwell in plating solutions longer to meet production requirements, it is important to increase the number of plating stations in the process operation. Such an investment is made only once, and can be amortized over a short period of time. The cost associated with operational inefficiencies can haunt a plater over many years, and will limit the quality of what is produced.

Effect of Brighteners & Additives

Q. What is the relationship between brightness of a deposit and uniformity?

A. Brighteners and additives, in general terms, work in one of two ways:

1. They are drawn to high current density areas and prevent deposits there (known as "cathode depolarization").
2. They are deposited in layers that retard the deposit of the primary metals at the highest current density areas.

In both cases, on a micro basis, the brighteners increase the uniformity of the deposit. On a macro basis, however, the greatest effect on the uniformity of a deposit is directly related to the bath chemistry and attention to bath parameters. The best uniformity is usually based on low-current density applications, but there is a trade-off in uniformity and production imperatives.

Improved Throwing Power

Q. How does one improve throwing power, other than by using external or auxiliary anodes?

A. The use of internal and auxiliary anodes is usually a last resort to properly deposit metals uniformly. Internal anoding is costly and difficult to administer. I would prefer to properly design tank anode structure, as well as the relationships between parts on racks and tooling. Shields, baffles and proper orientation of parts in the process system will aid you in your tasks more than anything else. Graham and Durney, in their books on electroplating engineering, have chapters concerning current distribution. These chapters are mostly related to operations by hard chromium platers, but the technology and techniques are applicable to all platers.

Another area to consider is the application of current density estimations. Current density is a wave function, and as such, the distance of the parts from the anodes will influence distribution, covering power and rate of deposit. Keeping that in mind, the factor of current density is determined by $1/D^2$.

Reaction of Additives & Impurities

Q. How much do impurities in the bath affect any specially placed additives?

A. Depending on their properties, impurities will affect the additives in a plating bath. Additives are very active materials, and they work in the plating solution by virtue of this activity. Reaction with the constituents in a plating bath are the targeted reactions, but the additives may also react with impurities and cause plating problems. The additives, in turn, will not perform as desired. A good plating process requires that it run in a relatively pure state, so filtration and purification from metallic and organic materials are important if you want high-quality, reproducible results.

Anode-to-cathode Ratios

Q. In a nickel sulfate bath, what is the best anode-to-cathode ratio?

A. In nickel sulfate solutions, the nickel anodes are 100-percent efficient, and as such, they will dissolve according to the amount of current that is flowing through them. If the anode area is too low, it will affect the additives and they will break down under an oxidation process. The anode baskets will become etched if the current density of the anodes is too low. It is important to measure the current density of the anodes, as well as the cathodes. In terms of deposit distribution and quality, the anode area should be kept at least 2:1 with the parts being processed.

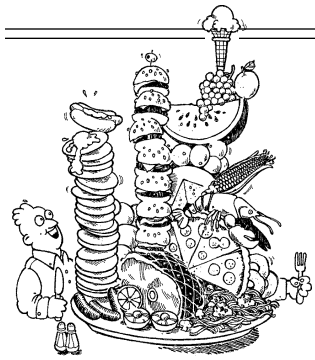
Adhesion Tests for Nickel

Q. What are the most common adhesion tests used for nickel plating?

A. Adhesion tests on nickel-plated components run the gamut, and depend on the criteria for the use of the components being processed.

1. Minimal testing involves cutting the deposit with a razor knife to see if there is any lift of the deposit.
2. A cross-hatching test involves cutting the desposit with a razor knife in a 1/15-in. cross-hatch, applying a tape and then lifting it off.
3. The most critical test is a grind-back test, where the deposit is cut along with the substrate, and a grinding wheel is applied in a direction that will lift the deposit if it is not properly adherent.

Some of the best references that exist on current distribution are available through AESF training and educational publications (such as *Electroplating Engineering Handbook*). Refer to the *1998 AESF Catalog*, or call Publications Sales at 407/281-6441. **P&SF**



Platers Gotta Eat!

A Restaurant Review
By Marty Borruso

Sometimes even platers get to have fun in the sun, so if you ever find yourself on business in Miami ...

Breakfast
Eleventh Street Diner, 11th St. at Washington Ave., Miami Beach
I am a diner-kinda guy, and this is a real diner. How real, you ask? It was built in 1948 in Wilkes-Barre, PA, where it stood for 44 years. In 1992, two of my friends from New York dismantled it and brought it to Miami's South Beach area, polished up the metal and hung up the "Open" sign. Lucky for us—the place is a gem. Not only does it look and feel like a diner, the food is the real stuff: Turkey dinners, meat loaf dinners, (s)mashed potatoes (with the peel), etc. But, as any diner aficionado knows, the secret is in the coffee, milkshakes and egg creams—and the Eleventh Street Diner passed the test. Open 24-hours a day, it is busiest from midnight to 6 a.m. (remember, this is South Beach).

Lunch
Joe's Stone Crab, 227 Biscayne St., Miami Beach
Ah, Joe's. This venerable restaurant is on the southern-most tip of Miami Beach. Go any farther and you'll be swimming. Joe's may have the freshest seafood in the country—they still use their own fishing boats, and have done so for almost 90 years. As the name suggests, you order stone crabs here, if you're smart. The large claws come to your table already cracked (thank goodness), and you can dip them in drawn butter or a tangy mustard sauce. They'll offer you a bib, if you'd like, and my advice is to *take the bib!* Be sure to order the cole slaw and a side of hash browns with the stone crab, and finish up your meal with the Key lime pie, a specialty of Joe's. Open for lunch and dinner, Joe's takes no reservations, so get there early to avoid a long wait. *(Note: There is a deal afoot that will enable New Yorkers to experience Joe's Stone Crabs at Lundy's on Neptune Ave. in Sheepshead Bay.)*

Dinner
Blue Door, at the Hotel Delano, 1685 Collins Ave., Miami Beach
Although there is a blue door at the entrance to the property, a more appropriate name for this restaurant might have been White Curtain. Lots of gauzy white fabric flows everywhere, giving the already-spacious room an airy feeling that makes you want to head for the beach right outside. But stay for something to eat—it's worth it. The Blue Door on trendy South Beach serves breakfast, lunch and dinner, with an accent on light, Florida cuisine. A fun appetizer is the poached salmon tartare, with fennel, capers and avocado. Follow that with grilled swordfish and braised potatoes, celery root and green scallion vinaigrette. There is also a nice rack of lamb on the menu, and a variety of delicious desserts.