Jewelry Manufacturers & Platers—Working Together to Engineer a Quality Finish

By Michael Akkaoui

How did Providence, RI, become a world leader in the jewelry industry? In part, it's because of the region's "vertical integration"—companies representing all facets of the industry, from metals suppliers to manufacturers to finishers, are located in the Providence area. This geographic proximity has allowed companies to work together to produce the best quality products. Electroplaters such as Tanury Industries, Lincoln, RI, encourage two-way communication between the manufacturer and the electroplater, resulting in high-quality jewelry products and satisfied customers.

Tanury Industries is one of New England's oldest and largest independent electroplaters. Founded in 1946, the company provides precious metal electroplating, coating and sputtering for the jewelry, eyewear, writing instrument, automotive, and other industries. Because so many jewelry manufacturers are located in the Providence area, Tanury encourages its customers to be deeply involved in the process of plating their jewelry products. The participation of the manufacturer allows the plater to produce the desired finish correctly ... the first time. In fact, for best results, jewelry manufacturers should be thinking about the finish they want very early on—at the design stage. By asking the right questions and relating key information to the plater, manufacturers can help "engineer" the best possible finish for their products.

The jewelry plating process steps are similar to those for other plated products. For jewelry to receive a high-quality finish, it must first be cleaned of any contaminants, such as compounds, oils or solder flux, that can obstruct the conduction required for electroplating. The cleaned part is placed on a metal rack and submerged in a series of cleaning solutions. Then the rack is negatively charged, attracting the microscopic ions of metal in the plating solution.

Copper usually is the first metal to be plated onto a piece of jewelry, because copper promotes adhesion and fills in porous areas on the piece. Nickel typically is the next metal to be applied. Nickel eliminates porosity and adds brilliance to the finish. If the manufacturer needs to comply with international regulations on nickel-free plating, an acid-copper solution is substituted for the nickel.

For its final finish, the jewelry piece may be plated with one of a number of metals, including gold, palladium, rhodium, silver or tin.

Base Materials

The first step in engineering a quality finish is for the manufacturer and plater to decide on a base metal. Each of the materials commonly used as a base for high-quality jewelry has specific characteristics that can cause variations in electroplating. A particularly porous metal, for example, will require more pre-finishing before the final plating can be effectively applied. Following are examples of commonly used base metals, and some of the idiosyncrasies that can affect their finishes.

Brass

Because it is not as porous as other metals, brass usually requires less copper in the pre-plating process. On the other hand, it is sensitive to staining and clouding during the pre-cleaning cycle.

Steel

Steel often carries surface oils that hamper adhesion of the finish, making it somewhat difficult to plate. Its surface must be thoroughly cleaned before proper plating can occur. Because of environmental concerns, many platers have eliminated solvent cleaning, which makes it even more challenging to remove oil from steel. At Tanuary, a more tedious and time-

consuming process using aqueous cleaners achieves the desired result.

White-metal Castings
These metals can be very porous, so they require large amounts of copper to seal them before plating. White-metal castings must also be hand-polished prior to plating if a high-quality finish is desired.

Zinc
Normal or direct-metal cleaning may destroy an item made of zinc. This metal requires special cleaning methods, as well as large amounts of copper pre-plating to protect it from the acidity of the nickel bath.

Metals also differ in the way they stand up to the plating process. Different metals, for example, can have different tolerances to nickel. A brass ear wire may tolerate a five-min nickel deposit, while the white-metal drop to which it is attached may require 10 min before the desired brilliance is attained.

Functional Use of the Piece Must Be Considered

Unlike some plated products, jewelry primarily has a decorative function. The appearance and long life of the finish are therefore the key criteria for success. In some cases, however, the product has a mechanical function—consider, for example, an earring clip or clasp. In these instances, the plater must be careful that the plating does not impede the functionality of the piece. Too heavy a plating could freeze the clip, making it useless. The plating deposition and specifications must be controlled to provide the best balance of appearance, protection and functionality.

Special Performance Criteria Required for Jewelry

How a plated piece is to perform—and under what conditions—plays a large role in the type of plating the piece receives. Performance characteristics can be categorized in the following three ways:

Adhesion—Good adhesion is primarily achieved by properly cleaning the piece prior to plating. The plating process itself is also a factor in adhesion, because the functional use of some jewelry products precludes the plater from depositing a finish that is too thick. Otherwise, there is the risk of cracking the plate during the product's intended use (such as opening and closing a clasp). A break in the adhesion of the plate will cause serious problems in appearance and functionality.

Corrosion—Jewelry products, especially those worn on an everyday basis, are subject to a number of corrosive elements. These elements include perspiration caused by body contact, as well as household cleaning products that contain corrosive acids.

Wearability—The third performance characteristic of interest to the jewelry electroplater is "wearability." This is the term used to denote the product's

Testing Guidelines

There are a number of laboratory procedures—from wear tests to corrosion tests—that can be conducted to measure the performance characteristics of a product. Sophisticated equipment and specialized techniques that are used throughout today's manufacturing process help the electroplater ensure that the finish imparted to a piece of jewelry meets the manufacturer's specifications *the first time.*

A variety of laboratory testing methods are available; manufacturers should consult with their platers to see which tests are best for a specific product. Whatever tests are selected, results will be enhanced by following these five guidelines.

- Prior to testing, check for proper plating thickness. Measure the product and record the results.
- Run a controlled test specimen with an improved test specimen to observe the improvement against a benchmark.
- Check the test periodically to observe time-to-failure, and record the results.
- Run to the stated test specification, or run to failure. Much can be learned from a test that goes beyond the stated time.
- Record the results. Always store and save test specimens with test dates and tests performed.

useful life span, before the finish becomes unacceptable to the user.

Desired Finishes

Electroplaters employ a number of plating processes to provide the manufacturer with a range of distinctive finishes.

Matte Finish
The piece of jewelry is cleaned, either through a sandblasting or vibratory finishing process, prior to plating. The matte look can be enhanced through the use of special coatings of dull nickel.

Oxide Finish
The plated piece is immersed in an oxide solution, causing it to take on a brownish or black color. It may then go through a tumbling or hand-relief process to give it an antique effect.

Satin Finish
The base metal is treated with a brush-polishing wheel to impart fine lines to the surface of the material prior to plating.

While plating is often thought of as the final step in the manufacturing process, there are a number of additional procedures that may await the plated product. Earring pieces, for example, may need to be assembled; a stone may be placed in a ring setting, and then crimped; a bracelet may be engraved. Each of these operations can affect the thickness of the plating desposition that is specified. It is critical, therefore, that the electroplater be advised of these requirements before plating begins.

Design Issues Can Affect Plating

Electroplaters sometimes wish they could be present when the jewelry designer first puts an idea down on paper. Chances are, the designer and manufacturer could be saved a good deal of effort if they understood how a particular design can determine whether the piece can be plated effectively. In jewelry finishing, electroplaters frequently face the following design challenges:

- Three-dimensional products create areas of high- and low-current density. The current in the plating bath is distributed unevenly, and areas with high-current density receive more than their share of the plating metal. The result is a finish that looks uneven—bright in some spots, dull in others. If the areas with less plating coverage also have high porosity, "bleed-out" may occur. This happens when insufficient plating coverage allows the base metal to oxidize to the surface.

- Hollow items can trap the plating solution inside the product. Once there, the solution requires a great deal of drying and cleaning time to remove it. Designers can eliminate this problem by placing drain holes in strategic areas throughout the product.

- When designing round items to be plated, designers should consider creating a hole somewhere in the piece, so that it can be mounted on a rack. Another solution to the problem is to use barrel plating, in which large quantities of jewelry can be finished at one time.

A Co-engineering Process

For the best plating results, two-way communication between the manufacturer and the electroplater is required. The manufacturer must provide information on how the product will be used and what aesthetic goals should be taken into consideration. The electroplater, in turn, shares his knowledge about various metals, designs and plating processes to help the manufacturer find the optimal methods to achieve the anticipated goals.

In the early days of the jewelry industry, manufacturers and electroplaters based in the Providence region may have found it easier to consult and discuss their needs through frequent meetings. Today, through instant electronic communications available to everyone, these co-engineering methods can be used to improve the quality of all jewelry, whether it is manufactured across the country or around the world.

About the Author

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