Nickel know-how

New nickel-phosphorus electrolytes make plating jobs easier, more cost-effective

BY LYNN STANLEY

Google Glass and other wearable tech gadgets headlined the developments announced at the 2014 International Consumer Electronics Show. This year, wireless charging and how it will work in the home took center stage.

Already steps ahead in material development, the trendsetter is Uyemura International Corp., recently introduced two new nickel-phosphorus electrolytes for the plating industry. These electrolytic nickel-phos electrolytes offer a stable, easy-to-use electroplating option at a significantly reduced cost compared with typical electroless nickel-phos electrolytes. Whether a manufacturer wants to produce components for RF applications such as remote charging devices or coating pipes and rods for oil patch customers, Niphos 967 and 968 provide a cost-effective yet high-performance alternative, company leaders claim.

A new formula

Applied to high-frequency wireless solutions, Niphos 967 and 968 could prove game changing for a market poised for explosive growth. High-frequency RF technology uses magnetic resonance to transfer power and signals over distances. Plated nickel is well established as a material for connectors, lead frames and sensors—the very links that route and reroute electrical and electronic power, control and signal movements between components.

As wireless and wearable digital technologies makes the jump to light speed, the high cost of electroless nickel could prove a stumbling block, a scenario that prompted the Southington, Connecticut-based Uyemura, to develop a new "recipe."

"Higher speed signal propagation is already here and requirements are expanding rapidly," says Business Development Manager Rich DePoto. "Users want lightning fast speed for today's high-performance equipment. In a world that is going wireless, people don't want to have to plug into a wall to charge their cell phone, tablet, laptop or other device. They want to be able to do it remotely. That requires higher, faster signal frequencies that will rely in part on metallized components that are diamagnetic." Diamagnetic parts exhibit no magnetic flux, a measure of the number of magnetic field lines passing through an area.

The magnetic properties of standard nickel slow signal speeds, making it ill-suited to support the advances in RF technology. Niphos 967 and Niphos 968, on the other hand, create a diamagnetic-plated metallic surface that surmounts that issue.

"By adding higher phosphorus content, we made that concern disappear and dramatically expanded the potential for using nickel in high frequency applications."

Electrodeposition—the process of coating a thin layer of one metal on top of another type of metal to change its surface properties—of the new nickel phosphorus electrolyte carries other advantages.

Until now, electroless nickel phosphorus (deposited using an autocatalytic chemical bath) has held sway over its predecessor electrolytic nickel, largely due to its ability to impart a uniform plating thickness and good throwing power for complex parts. The useful life of electroless nickel baths, however, is just three to five weeks. Plating time is often longer, higher plating thicknesses are problematic and these baths require higher operating temperatures. These features all translate into higher production costs.

"The major strike against electroless nickel is it's very expensive and consistency over the life of the bath is always challenging."

Electrolytic nickel phosphorus technology uses an electric charge in its chemical bath to drive the reaction. Less expensive than electroless nickel, the process has similar hardness, corrosion resistance and strength.

"We've taken existing technology to the next step by creating a very uniform, stable bath and expanding the operating window for processing using low concentrations of nickel. This elegant solution consistently achieves phosphorus contents up to 13 percent and has leveling capability," DePoto explains. "Our high-speed electrolytes do what electrolytic nickel couldn't do just 10 years ago."

The plating industry is very mature, DePoto notes. "To introduce something that is developmentally new but built on a well understood and established process has created quite a stir."