Copper anodes for electroplating
There are some things you can predict

Over the billions of years of their existence, we’ve come to understand the movements of the earth, sun and moon are fixed and known precisely. As a result, the inherent predictability of high or low tide can also be determined with great accuracy. If only we could gaze into our crystal ball to predict future events with the same accuracy.

With a Luvata anode – you can.

Similar to the predictability of sunrise and sunset, customers look to Luvata for consistent, predictable product performance. From the first shipment to the next, Luvata anodes are distinguished by their consistent, reliable and predictable performance.

Copper in electroplating
Electroplating is widely used in various industries for coating metal objects with a thin layer of a different metal. Electroplating can change the chemical, physical, and mechanical properties of an item.

The layer of metal deposited has some desired property, which the metal of the object lacks. An example of a mechanical change is a change in tensile strength or surface hardness.

Copper is commonly used in electroplating because it is a good metal to cover substrate defects that can accelerate corrosion. In addition, copper has a high plating efficiency while being among the least expensive metals in stable supply. Exceeded only by silver, copper’s high electrical conductivity makes an exceptional coating for products such as printed circuit boards.

Cleanliness
Cleanliness is essential to successful electroplating, as impurities can prevent adhesion of the coating to the intended object. Luvata’s discriminate copper cathode selection and stringent lean manufacturing processes, delivers shiny, clean copper anodes for predictable coating thickness and performance.

Luvata anodes offer the same predictable performance, just like the rising sun or full moon.

“When you first glimpse at a small round anode, it doesn’t appear all that complicated. But like many things – looks can be deceiving.

Luvata has been manufacturing anodes for nearly five decades. Enclosed we highlight the many key characteristics that distinguish a Luvata anode from all the others. There is a difference. From high-purity copper to its grain structure and from balls or slugs to plates and profiles, there are many differences.

With a Luvata anode, you receive consistent structural and chemical properties in each anode, delivering predictable and consistent performance from the first anode to the last. This gives Luvata anode customers electrical conductivity, plating and ductility performance on which they depend.

Don’t be deceived again – by a simple shiny copper ball. Understand the difference a Luvata anode makes.”

Jussi Helavirta
President & CEO
Luvata

Jussi Helavirta
President & CEO
Luvata
Superior copper material

At Luvata, each casting of both oxygen-free copper anodes and phosphorus copper anodes is made under highly controlled and optimum conditions. This leads to the lowest variation in structural and chemical properties and therefore high consistency of the end product. Luvata’s manufacturing process guarantees anodes to behave exactly the same way – from plating bath to bath.

Figure 1. Luvata’s anode balls contain large cast grains.

Ultimate high purity level
Impurities like iron, nickel, zinc and arsenic tend to dissolve in the plating bath and get enriched as time goes by. If the impurity level is high enough, elements start to interfere with the plating process by precipitating on the coating. This leads to lower electrical conductivity, stresses and changing mechanical properties of the coating. Impurities can reduce the physical properties such as ductility.

The Luvata advantage
The most important property of a Luvata anode is purity. Copper purity is essential. Pure copper means greater predictability. Luvata anodes have uniform grain structure and phosphorus content. Oxygen-free copper has no pores in the cast state and no copper oxide inclusions. Both oxygen-free and phosphorus deoxidized copper have homogeneous single phase structure that does not form sludge.

In the casting process phosphorus is added to the master alloy which melts very fast. Due to diffusion and continuous movement of the copper melt, the melt is instantly homogenous (evenly distributed in the melt). This leads to even phosphorus content in the anodes. A rapid and even black-film is evidence of uniform phosphorus distribution in Luvata anodes.

The copper crystal structure of Luvata cast balls consists of large grains, see figure 1. As a result of Luvata’s casting process, both grain size and shape are the same in the entire batch of anodes. Large copper grains dissolve evenly and guarantee a stable anode film on the ball surface. Large grain size also ensures better anode film adhesion and thus less anode sludge creation and less consumption of organic plating additives. Large crystals are very good in prevention of porous erosion of the ball and to avoid nodular plating caused by undissolved copper dust in the plating tank.

By Dr. Terhi Glas, Development Manager Luvata Pori

Specifications

Phosphorus copper anodes
Luvata phosphorous copper anodes have high quality plating properties and are widely used for demanding plating applications. The oxygen-free melt in the Luvata casting process gives the anodes a phosphorous content of P 0.04 – 0.06% that remains consistent from bath to bath. Phosphorous copper anodes are used in acid copper plating baths.

Oxygen-free copper anodes
Luvata oxygen-free copper anodes are made specifically for electroplating purposes. They have a high purity level (99.95% minimum) and have a clean surface. Because of their cast crystal structure and even particle size, Luvata anodes are easily dissolved and their free-flowing material allows ease of handling.

Phosphorous copper anodes

<table>
<thead>
<tr>
<th>Shapes</th>
<th>Sizes</th>
<th>Packing type</th>
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<tbody>
<tr>
<td>Balls</td>
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<td>diameter</td>
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<td>Dogbones</td>
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<tr>
<td>Hexagonals</td>
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| all dimensions mm; ask for other shapes and sizes

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At Luvata, each casting of both oxygen-free copper anodes and phosphorus copper anodes is made under highly controlled and optimum conditions. This leads to the lowest variation in structural and chemical properties and therefore high consistency of the end product. Luvata’s manufacturing process guarantees anodes to behave exactly the same way – from plating bath to bath.

Ultimate high purity level
Impurities like iron, nickel, zinc and arsenic tend to dissolve in the plating bath and get enriched as time goes by. If the impurity level is high enough, elements start to interfere with the plating process by precipitating on the coating. This leads to lower electrical conductivity, stresses and changing mechanical properties of the coating. Impurities can reduce the physical properties such as ductility.

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The copper crystal structure of Luvata cast balls consists of large grains, see figure 1. As a result of Luvata’s casting process, both grain size and shape are the same in the entire batch of anodes. Large copper grains dissolve evenly and guarantee a stable anode film on the ball surface. Large grain size also ensures better anode film adhesion and thus less anode sludge creation and less consumption of organic plating additives. Large crystals are very good in prevention of porous erosion of the ball and to avoid nodular plating caused by undissolved copper dust in the plating tank.

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Applications

What does Luvata see for the future?
We will use our unique technology know-how to influence the development of a sustainable modern world. We have always aimed to improve our customers' products and processes, and to help them increase the efficiency of their businesses. But our vision is bigger than that. If human society is going to maintain the lifestyle that we all enjoy today AND offer it to emerging societies, we will all need to become much more efficient and to take much less from the planet. We are helping companies to make their products, processes and production more sustainable: do more, waste less, and pollute less.

What’s Luvata’s plan for getting there?
Luvata looks to build on its distinct strengths, bringing expertise and dedication to high growth regions and adjacent markets around the world. We are stepping into niche and specialist markets with our high-value, engineered solutions, and we are developing new solutions in partnership with our customers to conquer challenges at the front end of market demand.

How does Luvata behave?
In doing all this, we resolve to be the partner of choice for our customers, the employer of choice for our staff, and to be a positive and responsible friend to everyone else. We strive to be open-minded and focused on getting results, and when we promise, we deliver.

Where in the world are we?
Our global footprint stretches across the Americas, Europe and Asia. Our diversity of locations, cultures and markets gives us access to a wealth of knowledge and expertise that simply keeps growing. It means that we are local to our customers, wherever in the world they are and can be responsive to their needs, including fast local delivery straight to the door.
About Luvata

Luvata is a world leader in metal solutions manufacturing and related engineering services to industries such as renewable energy, automotive, healthcare, and power generation and distribution. The company’s continued success is attributed to its longevity, technological excellence, and strategy of building partnerships beyond metals. Employing over 1,400 staff in 7 countries, Luvata works in partnership with customers such as ABB, CERN, Siemens, and Toyota. Luvata is a group company of Mitsubishi Materials Corporation.

www.luvata.com