## What is anodizing?

Anodize is a coating of aluminum oxide that is grown from the aluminum by passing an electrical current through an acid electrolyte bath in which the aluminum is immersed. The coating thickness and surface characteristics are tightly controlled to meet end product specifications. Aluminum oxide is an extremely hard material that approaches the hardness of a diamond. As a result, the aluminum oxide layer provides excellent wear and corrosion protection.

## What is the purpose of anodizing?

General reasons for anodizing are: wear resistance, corrosion resistance, surface lubricity, heat dissipation, dielectric (non-conductive) properties, adhesion, and aesthetics.

## Is anodizing environmentally friendly?

Yes, anodize does not entail the use of heavy metals nor does it produce toxic waste. Anodize meets the environmental and safety directives of the FDA, USDA, ELV, WEEE and RoHS.

## What substrates or base metals can be anodized?

The three substrates that can be anodized are aluminum, titanium, and magnesium. Steel or stainless steel cannot be anodized.

## Is there a price difference between conventional and hard anodize?

Hard anodize is more expensive due to increased energy requirements associated with the process. Ending cost differences are dependent upon many variables in a given order. For example: part size, racking instructions, packaging, etc.

## What colors are available for anodize?

See Dye Color Chart

## What alloys are best for anodizing?

In general, wrought alloy series 1000-7000 provide the best corrosion and aesthetic properties than cast alloy. Specific alloy choice to match performance needs should be discussed on a case-by-case basis. For more information on alloy series and their effects on the anodize process, please visit our Alloy Specs section of the Knowledge Base.

## What alloys are best for bright dip anodizing?

The following alloys are generally considered best for bright dip anodize: 5357, 5457, 5557, 6063, 6463, 7016, 7029

For more information on the bright dip process, please visit our website.

## What is the difference between Type II “conventional anodize” and Type III “hard anodize”?

Type III or hard anodize offers a more dense aluminum oxide layer. To produce this requires increased electricity consumption and a super cooled electrolyte bath. Perhaps the best way to illustrate differences between type II “conventional anodize” and type III “hard anodize” is in the following chart. Notice the enhanced attributes of hard anodize versus conventional anodize.

| | Type II Conventional Anodize | Type III Hard Anodize |
|---|---|---|
| Corrosion Resistance | <336 Hrs salt spray | 1000 - 2000 Hrs salt spray |
| Wear Resistance | Good wear resistance | Excellent wear resistance (Same range as ceramic & hard chrome) |
| Di-electric Properties | Good Di-electric strength (Non-conductive) | Excellent Di-electric strength (Extremely non-conductive) (Capable up to 1500 volts when sealed) |
| Thickness Capabilities | 0.0001" - 0.001" (0.0005" Required to dye) | 0.0005" - 0.003" (Dependent on alloy) |
| Appearance | Clear or dyed | Natural dark gray color |
| Penetration/Growth | Approximately 65%/35% (Dependent on alloy) | Approximately 50%/50% (Dependent on alloy) |

## How much substrate material is removed during the Bright Dip process?

Approximately 0.0002” per side for a standard 3 minute process. (Alloy Dependent)

## How much substrate material is removed during the etch process? (Acid & Alkaline)

The amount of substrate material removed during the etch process will affect part dimensions. The exact amount is alloy dependent and must be determined on a case-by-case basis.

## Can anodize be welded or soldered?

Parts can be welded prior to anodizing. The use of 5356 welded rod is strongly recommended, though some discoloration will still occur. 4043 is the worst choice because it will turn a smutty black when anodized. If welding is necessary after the anodize process, the coating on the portion to be welded must be removed.

## Will anodize affect the adhesion of paint or subsequent coatings?

Anodize will promote the adhesion of paint and subsequent coatings.

## Will anodizing hide scratches?

Anodizing will provide minimal cover-up for surface scratches because anodize mimics original substrate finish. To further enhance anodize appearance consider aggressive etching, hand polishing, or surface blasting.

## What are the benefits of electroless nickel plating?

Electroless nickel is one of the most versatile finishes, capable of meeting your needs from wear and corrosion protection to lubricity concerns. The uniform plating thickness of electroless nickel allows for tight tolerances to be achieved. “Electroless” plating avoids the snags of electroplating such as uneven buildup that can compromise threadings and part fittings, which can require post process grinding. Electroless nickel offers some of the best corrosion protection of all plated metals. At Pioneer Metal Finishing, we offer electroless nickel solutions designed specifically to produce wear resistance, corrosion protection, or lubricity.

## What substrates can be electroless nickel plated?

Pioneer Metal Finishing can plate:

- All steel alloys
- All copper alloys
- All aluminum alloys

## What is the difference between electroless nickel and hard chrome?

Some applications of electroless nickel offer 1000+ hours of salt spray corrosion protection. Hard chrome can only offer 24 hours. Hard chrome offers slightly better wear protection than electroless nickel. Pioneer offers the Nor-Last™ electroless nickel process that provides similar wear resistance as hard chrome.

## Can an electroless nickel-plated part be stripped and replated?

Yes, the original electroless nickel coating can be stripped without changing the surface finish & dimensions of the substrate in many cases. Aluminum and copper alloys may become rougher and lose some base material.

## Can an electroless nickel-plated part be replated without stripping?

This can be done, but the adhesion of the new plating to the old plating cannot be guaranteed.

## What thickness tolerance is achievable with electroless nickel?

Tolerances of ± 0.0001” are possible with electroless nickel plating.

## What is the maximum electroless nickel coating thickness achievable?

Typical thicknesses range for production is 0.0001” to 0.005”. Theoretically it is possible to plate an unlimited amount of Electroless Nickel on a given part. Coating thicknesses beyond .005” may be more prone to chipping due to built up stresses in thicker coatings.

## Why should you bake electroless nickel after plating?

Post process baking minimizes hydrogen embrittlement, promotes adhesion when plating an aluminum substrate, and increases surface hardness and wear resistance.

## What is hydrogen embrittlement?

When performing the plating process, hydrogen gas is generated. When the base metal or substrate has been hardened to above 35 Rc, absorption of the hydrogen can cause parts to become brittle.

## Are there any negative impacts created during the baking process?

Depending on the bake process required, it is possible to see discoloration, reduced corrosion resistance, and reduced lubricity characteristics.

## What does “high phos” electroless nickel refer to?

Electroless nickel finishes are often distinguished by their respective phosphorous content. In particular, high phos. electroless nickel contains roughly 10-12% phosphorous, and is designed to offer supreme corrosion resistance.

## What is medium phos electroless nickel?

Pioneer Metal Finishing’s medium phos. electroless nickel is engineered to be the standard electroless nickel process providing a balanced combination of wear resistance, corrosion protection, lubricity, and affordability.

## How do Pioneer Metal Finishing’s specialty electroless nickel processes differ from high and medium phos. processes?

Other Pioneer electroless nickel finishes are engineered for more specific applications. For example, Nor-Last™ is designed to be the best electroless nickel application for wear resistance. Nor-Lube™ is designed specifically to produce extreme lubricity capabilities. For more information on Pioneer’s electroless nickel finishes, please visit our How can I determine which process I should choose given the operating environment?

Many variables are at work here. To determine the optimal process, please contact a knowledgeable sales engineer or customer service rep for further help and clarification. Pioneer Metal Finishing offers testing solutions to identify the best process for given environments.

## What information is needed to generate a quote?

- All contact information
- Color information (If part is to be dyed)
- Required finish
- Delivery lot size
- Yearly usage
- Blueprint or part dimensions

## What tests are performed to verify characteristics of various processes?

- Corrosion protection - Salt spray testing
- Wear resistance - Suga and Taber testing
- Hardness - Rockwell, Knoop, Vickers
- Lubricity - Coefficient of friction testing