



The Right Finish for Architectural Aluminum

What is Anodizing?

Developed more than 50 years ago, anodizing is a simple electrochemical process that forms a protective coating of aluminum oxide on the aluminum surface. The finish is very durable; however the lifetime of the finish is proportional to the thickness and density of the anodic coating as well as the quality of the seal.

Aluminum oxide is a hard, durable, weather resistant coating that protects the base metal. The coating may be clear or colored using various methods. The coating itself grows from the base aluminum metal by way of the electrochemical process, so the coating is integral to the metal and cannot peel or flake. The coating's structure consists of many small pores that can be used to color the aluminum. Once color is added, these pores are sealed to provide durability. This durability has been recognized by the aerospace industry, which selected anodizing as the finish of choice for the space station.

Advantages of anodizing

- Anodizing can be less expensive to produce and maintain.
- Anodic coatings are highly abrasion-resistant and durable. It is particularly durable in high-traffic areas where the coating is subject to physical abuse and abrasive cleaners.
- Anodic coatings do not peel, chip, flake, or chalk.
- Anodic coatings are translucent, resulting in a deep, rich metallic appearance.
- Anodic coatings are scarcely affected by sunlight.
- Anodic coatings are excellent finishes for areas subject to filiform corrosion, especially structures in coastal locations.
- The anodizing process uses chemicals without VOCs, and aluminum itself is recyclable.
- Anodized aluminum can be colored in a full spectrum of shades.
- Several coloring techniques offer weather fastness suitable for architectural applications.

Anodizing: the renewable finish

A thicker and denser anodic coating carries the advantages of durability and longer life. After many years, an anodized surface may accumulate dirt and stains that look similar to chalking paint. This film can be removed with a mild detergent applied with an abrasive cleaning technique. A small amount of the anodic coating can actually be removed, leaving behind a renewed anodized finish, preserving the original appearance.

Information courtesy of
Aluminum Anodizers Council

For more information, go to
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When a paint film fails, the usual options are to recoat the surface with another paint or replace the metal. Scrubbing can damage a painted finish. When an anodized coating appears to have failed, cleaning often results in a renewed appearance. Anodized surfaces, like other building components, must be protected from chemical attack after installation.

Anodizing and the Environment

There are environmental advantages to selecting anodizing as an architectural finish. The process does not require the use of solvents that contain volatile organic compounds (VOCs) and no heavy metals are involved.

Chemical wastes from anodizing are used by many municipal wastewater treatment facilities to balance pH levels of treated water. The aluminum hydroxide from the effluent of anodizing plants improves the separation of solids in wastewater treatment plants. If local wastewater treatment plants cannot handle the solids generated in the anodizing process, equipment is available that enables anodizers to remove aluminum hydroxide solids from the effluent.

Color

In most situations, anodized coatings exhibit excellent color consistency, but this does not mean that anodizing yields perfectly consistent color. Customers must be careful in selecting the colors to be used and should have the metal processed at the same time and in the same place whenever possible to reduce the likelihood of color variation.

Care must be taken when applying touch-up paints to anodized finishes because a perfect match is impossible between the factory-applied finish and a finish applied in the field. For this reason, touch-up paints are a problem for both painted and anodized coatings.

Customers often present questions about color variation within the context of color range. A “range” implies a two-dimensional axis, for example, a range from light to dark. Research has shown that lightness is only one of at least three dimensions of appearance. Most people are familiar with the controls on a television set that affect brightness, color, and hue. When these same three components of appearance are combined with gloss and texture, we have at least four variables that can influence appearance besides light and dark.

The word range is discouraged when describing color. It is better to focus on scientific color measurement systems that include color, lightness, and gloss. With scientific color measurement techniques, a production run can be compared objectively to an approved standard. If a component is significantly different from an approved standard, the finisher should not ship it. It is also the customer’s responsibility to avoid using metal that is not acceptable. When large anodized panels or extrusions are used in close proximity to each other, it may be possible to see color variations. In application, it is common to sort parts to obtain the desired effect.

The industry has visual comparisons as the criteria for color matching and for the most part color reproducibility has not been a problem. Color evaluation using color instruments is helpful but not the solution to producing a consistent color match. To avoid problems, the customer should agree on color standards with the anodizer.



Durability

Coating thickness is a significant indicator of durability for anodized coatings. Coating thickness for architectural use can be specified as either Class 1 (0.7 mil) or Class 2 (0.4 mil) per Aluminum Association DAF 45. However, oftentimes there is no specification. When there is no specification, the least expensive option is usually used, and in a few years the finish is pitted, stained, and eroded. Another important determinant of coating life is its density. The denser the coating, the longer it will last.

Low-cost anodized sheets are often sold with a coating thickness of 0.15 mil. A finish of this thickness also might be called a 200, A21, A22 or A24. While this coating thickness is suitable for many applications, the integrity of this finish will not last more than a few years in exterior architectural applications and the expected lifetime is much less in coastal environments. Coating thickness makes an even more important difference in the durability of organically dyed finishes. Dyes fade more quickly with thinner coatings since they contain less color substance.

There are many options for finishing aluminum, and this is one reason aluminum is such a popular material. It is not always easy to decide which finish to apply. Communicate your needs with your finisher or your finisher's supplier. Consider not only appearance, but also the environment, maintenance requirements, and life cycle costs.

The Aluminum Anodizers Council

In 1988, a group of anodizers and suppliers, concerned that the market was unaware of the features and benefits of anodizing, formed the Aluminum Anodizers Council. The Council works to promote the advantages of anodizing, serves as a technical resource center for members and customers, provides technical information through workshops, articles and seminars, and develops and upgrades industry standards.

Conclusion

Anodizing is the superior finish. Its appearance, abrasion resistance and cost effectiveness are unlikely to be matched by any organic coating. We invite you to specify anodizing, as it truly is a versatile finish for many applications, from storefront to handrail; from automotive to decorative applications. If you are considering the use of an anodized finish for an architectural application – or for another use – you are encouraged to contact an AAC member firm. Click on the Member Directory below to find an anodizer near you.

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