KMF

WHAT IS ANODISING?

Introduction

Anodising is an electrochemical process that transforms the surface of metals, particularly aluminium, into a more durable, corrosion-resistant metal with an aesthetically pleasing finish. This process not only enhances the metal's natural properties but also opens more possibilities for its use in different industries.

Anodising is a surface treatment technique that involves creating a controlled oxide layer on the surface of the metal. This layer is integrated into the metal itself, making it exceptionally hard and resistant to wear and tear. Unlike paint or plating which can chip or peel over time, anodised finishes are part of the metal, ensuring long-lasting protection.

The process is most associated with aluminium, but it can also be applied to other metals like titanium and magnesium. The result is a surface that is not only tougher but also more receptive to dyes, allowing for a wider range of colour options. This makes anodised metals a popular choice for both functional and decorative applications.

How does anodising work?

The anodising process sounds complex, but it's based on electrochemical principles. Here's how it works:

1

Preparation:

The metal, typically aluminium, is first cleaned thoroughly to remove any dirt, grease, or impurities. This ensures that the anodising process is even and effective.

2

Electrolytic bath:

The cleaned metal is then submerged in an electrolytic solution, usually containing sulfuric acid. This solution acts as the electrolyte in the electrochemical cell.

3

Electrical current:

An electrical current is passed through the solution, with the metal acting as the anode (hence the term "anodising"). This causes oxygen ions to be released from the electrolyte and bond with the metal atoms on the surface.

4

Oxide layer formation:

The reaction between the metal and the oxygen ions forms a layer of metal oxide on the surface. This layer is porous, which allows for further treatments (such as dyeing).

5

Sealing:

After the desired thickness of the oxide layer is achieved, the metal is sealed to close the pores. This step enhances the metal's resistance to corrosion and wear.

The result is a surface that is harder, more durable, and more resistant to environmental factors than the original metal. The thickness of the oxide layer can be controlled depending on the intended use of the metal, ranging from a few micrometres for decorative purposes to several tens of micrometres for industrial applications.

How do you anodise aluminium?

Anodising aluminium is like the process explained above but has more specific steps:

1

Cleaning:

The aluminium is cleaned using a combination of alkaline and acidic cleaners to remove any surface contaminants. This step is crucial for ensuring a uniform anodised finish.

2

Etching:

The metal is then etched to remove a thin layer of aluminium, which helps to create a smooth, uniform surface. This step also enhances the adhesion of the oxide layer.

3

Anodising:

The aluminium is immersed in the electrolytic bath, and the electrical current is applied. The voltage and current density are carefully controlled to achieve the desired thickness and properties of the aluminium oxide layer.

4

Dyeing (Optional):

If a coloured finish is desired, the porous oxide layer can be dyed at this stage. The dye is absorbed into the pores, creating a vibrant and long-lasting colour.

5

Sealing:

Finally, the aluminium is sealed to close the pores and lock in the dye (if used). This is typically done using hot water or a sealing solution that reacts with the oxide layer to form a hydrated oxide, which is more stable and resistant.

The entire process can take anywhere from a few minutes to several hours, depending on the desired outcome. The result is a piece of aluminium that is not only more durable but also more visually appealing.

Can you anodise stainless steel?

The short answer is no, stainless steel cannot be anodised in the same way as metals like aluminium.

The reason lies in the fundamental differences between the two metals. Aluminium naturally forms a thin oxide layer when exposed to air, which can be thickened and controlled through the anodising process. Stainless steel, on the other hand, already has a passive oxide layer that provides corrosion resistance. This layer is not porous like the one formed on aluminium, making it unsuitable for the anodising process.

However, stainless steel can undergo other surface treatments, such as passivation or electroplating, to enhance its properties. These processes can improve its corrosion resistance, appearance and durability, but they are not the same as anodising.

Top uses for anodised metals

Anodised metals are incredibly versatile and are used in a wide range of applications across various industries. Here are some of the top uses for anodised metals:

Aerospace

The aerospace industry relies heavily on anodised aluminium due to its lightweight and durable properties. Anodised components are used in aircraft structures, engines and interiors, where they provide excellent corrosion and wear resistance.

Architecture

Anodised aluminium is a popular choice for architectural applications, such as window frames, curtain walls and roofing. Its durability and aesthetic appeal make it ideal for both structural and decorative purposes.

Electronics

Smartphones, laptops and tablets all use anodised aluminium casings. This helps to protect the fragile electronic components inside the devices.

Automotive

In the automotive industry, anodised aluminium is used for both exterior and interior components. It's commonly found in trim, wheels and engine parts, where its resistance to corrosion and wear is ideal.

Cookware

Anodised aluminium is also used in the manufacture of cookware. The anodised surface is non-reactive making it safe for cooking and easy to clean.

Medical equipment

The medical industry uses anodised metals for certain instruments and equipment. The process provides a sterile, corrosion-resistant surface that is essential in a medical setting.

Sports equipment

Anodised aluminium is used in the production of some sports equipment, such as bike frames, golf clubs and camping equipment. Its lightweight and durable properties make it ideal.