VALKON, INC.
Architectural
Innovation Solutions

Anodizing

process

Anodizing is a process employed to alter the surface of aluminium and create an artificial oxide layer (rust). As this process is implemented under totally controlled conditions, this oxide layer is highly cohesive and solid. This layer is already an oxide, so when exposed to air, it is not subject to further oxidation and the underlying aluminium is thus protected. The anode coat is clear, with a porous texture; it allows the embedding of dyes to achieve coloration.

The following are some of the particular features of anodizing:

- The anodized layer is an inherent part of the metal mass, thus preventing adhesion problems.

- Anodizing offers excellent corrosion resistance features, provided that the production process, application and use are closely regulated.

- Anodized aluminium products present a metallic appearance.

- The colour range is restricted.

Anodizing is an aluminium surface treatment used for over 60 years. This period allowed the sector to overcome any practical problems associated with the method and develop suitable mitigation techniques. Sixty years down the road, it is now believed that anodizing and its behaviour over time have been fully understood.

Anodizing

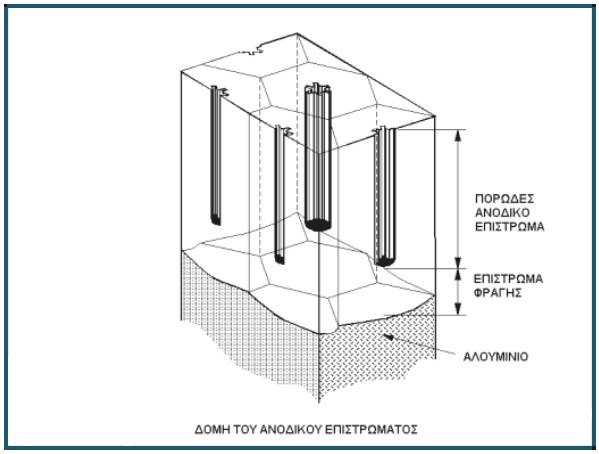
The development of the anodized layer comprises of the following main phases: preparation, anodizing, painting (if required) and sealing.

Preparation:

Surfaces to be anodized are subjected to mechanical or chemical grounding by suitable abrasive materials or chemical reagents. Such treatment is aimed at producing a glossy or mat surface appearance. Then, aluminium parts are subject to degreasing / etching and neutralization.

Anodizing:

This process uses the electrolytic principle (passing direct current through a sulphuric acid bath) under strictly controlled conditions of chemical concentrations, temperature, current density, etc. The electrolysis results in a - totally controlled - oxidation of the aluminium surface. The anode coat is clear, resembling glazing. Furthermore, the anode coat is not continuous and exhibits surface pores (Fig. 1).



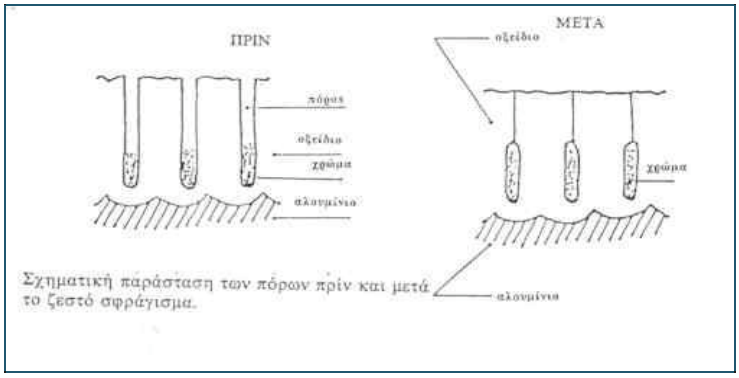
ΔΟΜΗ ΤΟΥ ΑΝΟΔΙΚΟΥ ΕΠΙΣΤΡΩΜΑΤΟΣ

Colouration:

Colouration of the anodized aluminium is achieved by depositing coloured elements in the pores of the anode coat (electrolytic colouration). This procedure is performed after the anodizing phase but before sealing. Colouration is performed by immersing products in a bath containing metallic ions (e.g. tin, cobalt, nickel, etc). Metallic ions are deposited on the pores of the anode coat; thus, any surface colour can be obtained.

Sealing:

The sealing of the pores is one of the main processes to ensure appropriate aluminium protection. Where pores are located on the anode coat, anodizing thickness is very low (2-3 microns) and therefore protection is poor at these points. The sealing process consists in hydrating the aluminium oxide; pores are sealed by the resulting expansion.



Σχηματική παράσταση των πόρων πρίν και μετά το ζεστό σφράγισμα.

In addition, if case colouration has been performed previously, dyes are trapped in the pores, thus ensuring long-term colour stability. The dyes are visible since the anode coat is clear (glazed).

Qualitative characteristics of anodizing

Appearance:

The finished appearance of products depends on:

- The metallic alloy. This alloy must be definitive; vendors must certify that the material is suitable for anodizing and conformant to applicable specifications.
- The method of surface treatment (mechanical and chemical) before anodizing. Thus, the finished appearance can be glossy or mat.
- The surface treatment applied after anodizing, e.g. colouration or sealing conditions.

Oxide thickness:

The thickness of the anodized coat corresponds to the thickness of the aluminium oxide coating in microns (ìm = thousandths of a millimetre) of the significant surface. Depending on the application and installation environment of leach structure, the minimum permissible anodizing thickness is specified. Thus, the following can be specified:

- indoor areas: minimum anodizing thickness: 10 ìm (microns)
- outdoor areas in a regular urban environment: minimum anodizing thickness 15 m (microns)
- outdoor areas in a corrosive environment (sea, industrial): minimum anodizing thickness: 20 ìm (microns)

Sealing of anode coat:

The quality of sealing is one of the main quality properties of the anode coats. A poorly sealed anode coat will be vulnerable to atmospheric pollutants, contaminating the pores where the coating is only a few microns thick. Clearly, an insufficiently sealing anode coat, even when its thickness is several microns, is unable to protect the aluminium against oxidation. In addition, sealed coloured anode coats help enclose the dyes inside the pores, thus ensuring the long - term stability of colours.