Description

Image

Image caption

(1) Titanium anodizing equipment, used for colourizing small pieces of this metal in jewellery © Mauro Cateb at Wikimedia Commons (CC BY 3.0) (2) Construction frames © Anni_mh at Pixabay [Public domain]

The process

In ELECTRO-PAINTING the component forms the cathode in an electrolytic cell. The anode is inert - usually graphite or stainless steel, and the electrolyte is an aqueous solution in which the pigment is emulsified. An alkaline environment builds up at the cathode, causing the lacquer to coagulate. The charged particles of pigment are dragged by the field onto the surface of the component where they form a strongly bonded film. The film is relatively thin (13 - 15 microns), but gives good corrosion resistance, particularly if baked at 150 - 230 C after deposition. Other layers of paint are applied on top. The principle can be compared with electro-plating, and is widely used in the automobile industry.
In AUTOPHORETIC PAINTING the component is submerged in a bath of emulsified pigment. Ion exchange between the component and the solution causes the charged particle of paint to be attracted to the component where they merge to form a continuous film.

Process schematic

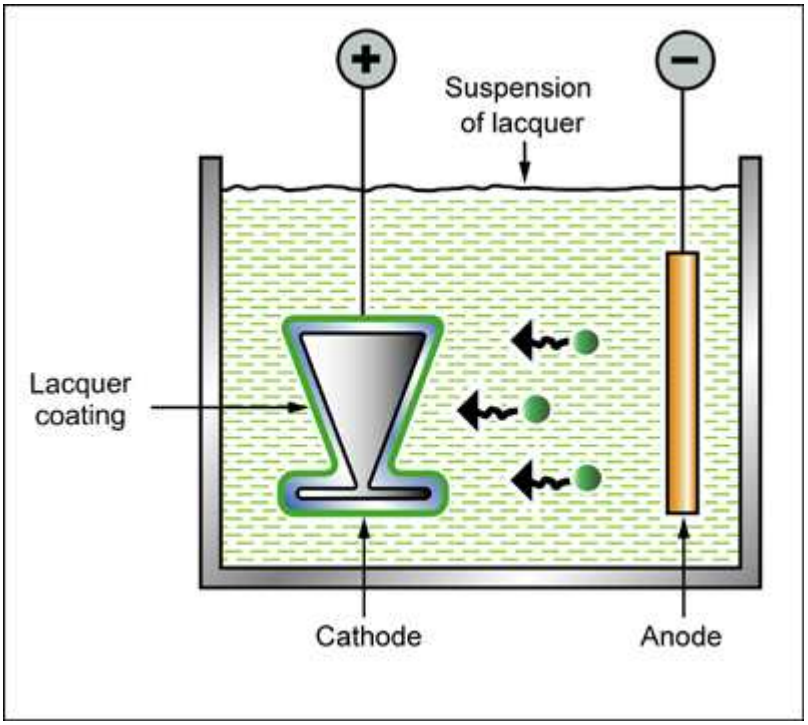

Figure caption

Electrophoretic painting

Material compatibility

Metals - ferrous	✓

Function of treatment

Corrosion protection (aqueous)	✓
Corrosion protection (organics)	✓
Decoration	✓
Color	✓

Economic compatibility

Relative tooling cost	low
Relative equipment cost	medium
Labor intensity	low

Physical and quality attributes

Surface roughness (A=v. smooth	A			
Curved surface coverag	Very good			
Coating thickness	0.394	-	1.18	mil
Coating rate	100	-	200	µm/s
Surface hardness	5	-	10	Vickers
Processing temperature	80.3	-	170	℉

Process characteristics

Discrete	✓

Supporting information

Design guidelines

The process largely used to give uniform undercoats on large, complex components. It lends itself to large volume production of products coated with the same color; examples are the electro-painting of a white paint on metal window and door frames and undercoating of auto body shells. The paint layer is distributed evenly over the surface, even in those areas that would otherwise be inaccessible. The main disadvantage is the requirement of a single, uniform color.

Technical notes

Electro-paint films are always deposited from a dip tank. The operating bath consists of resin concentrate and pigment concentrate mixed with de-ionized water and small amounts of solubilizers and de-foamers. The concentration of non-volatile solids in the bath varies from about 10 to 20%, depending on type and composition. This process sometimes uses autophoretic paints; these are water-reducible paints deposited on metal surfaces by the catalytic action of the metal on the paint materials in the bath. Currently, only ferrous alloys activate the electro-paints available commercially. Tubular automotive frames are coated by this method, because the entire length of the tubing can be coated inside and outside with equal ease.

Typical uses

Undercoats for body lacquering of car bodies, single-color coatings for appliances, architectural panels and

The economics

The tooling costs are low; the capital cost

The environment

The process poses no particular environmental

Links

MaterialUniverse

Reference