POLIGRAT Processes for Titanium

POLIGRAT offer a full range of proven processes and products for the industrial application on Titanium.

All processes have been developed by POLIGRAT and are provided either by supply of special plants and chemicals for in-house application by the customer or through subcontract work by POLIGRAT.

The final surface treatment of Titanium after mechanical or thermal treatment is decisive for the later performance of work pieces.

POLIGRAT offer adequate processes for all demands:

Pickling

Chemical pickling is an intense cleaning process and removes contamination, oxides and small defects. It dissolves a thin layer of material from the surface and restores the corrosion resistance. Most pickling procedures are based on mixtures of hydrofluoric and nitric acid. Their application leads to generation of hydrogen on the surface. Since Titanium readily takes up hydrogen, there is a threat of hydrogen embrittlement especially on high tensile parts.

POLINOX-TB 100 is a special immersion pickling process for Titanium and Titanium Alloys without any development of hydrogen by the treatment. The material removal is very uniform and easy to control. The removal rate of approx. 1 µm/min also allows the controlled removal of thicker layers without preferential attack to the grain boundaries. After treatment with **POLINOX-TB 100** the surfaces show a uniform silvery satin gloss. They don't need a special passivation.

POLINOX-TB 100 in a consistence ready for application contains hydrofluoric acid in a concentration well under 1 %, hydrogen peroxide and special organic additives. It is free of nitric acid and nitrides, not fuming and not classified as poisonous but only irritating. It is applied at room temperature.

Chemical Polishing

Chemical polishing provides shiny, smooth and deburred surfaces of high quality. The treatment uniformly takes place on all wetted areas.

Tichem-T 100 is an efficient dipping process for chemical polishing of Titanium and Titanium Alloys providing highly polished surfaces on Titanium Alloys and satin finish on pure Titanium after short treatment times. The removal rate is 2 – 4 µm/min on pure Titanium and 5 – 10 µm on Titanium Alloys.

Treatment with **Tichem-T 100** does not generate hydrogen and is well applicable to small high tensile parts like screws, nuts and bolts.

Tichem-T100 is free of nitric acid or nitrides. It is based on hydrofluoric acid with low concentration, hydrogen peroxide and additives. The polishing reaction is exothermic, therefore polishing tanks should be equipped with an efficient cooling system.

Electropolishing

Electropolishing of Titanium and Titanium Alloys provides highest surface quality in view of smoothness, cleanness, uniformity, corrosion resistance and fatigue resistance. Electropolishing removes deteriorated material layers, burrs and particles as well as surface stresses.

Process **E 398** is a superior electropolishing process for Titanium, Titanium Alloys and Nitinol. It is stable and safe in application comparable to electropolishing of Stainless Steel. The electrolyte **E 398** is free of fluorides and chlorides like hydrofluoric acid, ammonium bi-fluoride or perchlorates. It does not produce fume or smell. The electropolishing process produces oxygen on the surface of parts, so there is no risk of hydrogen embrittlement.

The electrolyte **E 398** is not poisonous and does not chemically attack surfaces without current or through rinsing process. It can be safely applied also to large parts like vessels, heat exchangers and sheets. The process works at room temperature and is used under conditions like electropolishing processes for stainless steel. For electric contacts and jigging Aluminium is suitable.

Anodising

Anodising of Titanium is performed to improve corrosion resistance, marking of parts for identification and for improving hardness of surfaces as well as reducing friction and wear and to avoid galling. There are two different types of anodising offered by POLIGRAT:

- **Titancolor-2** produces a thin and transparent surface layer consisting of Titanium oxide by anodic oxidation. Depending on the thickness of the layer a distinctive range of attractive colours is produced by light interference. Basically the range of colours corresponds to the rainbow colours.

  Titancolor-2 is safe and stable in application. The colours can be distinctively achieved by setting the voltage. Every colour corresponds to a defined voltage producing a layer of controlled thickness.

- **Titan Grau II** produces a solid and dense ceramic layer of Titanium dioxide by anodic plasma discharge. The colour of the layer varies from bluish grey to light grey, depending on the content of Aluminium in the alloy.

  For application of **Titan Grau II** the parts to be coated are submersed into a tank with special electrolyte. Starting from a voltage of 200 V the plasma discharge starts and by and by it affects and coats the whole surface area including bores and recesses and finally even the contact area.

  The layer produced by **Titan Grau II** has a thickness of 1 – 3 µm. The layer is dense and resistant to acids and alkalis except hydrofluoric acid. It is insulating. The surface is smooth and has low friction against Titanium and other metals.

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