Electrolyzers/CP Anodes

Any thing “Titanium”, try us…….

Applications

- Electro-dialysis in waste water treatment, water conditioning and the synthesis of organic compounds.
- Cathodic protection of various structures like offshore, ships, reinforcement bars in concrete.
- Wet electro deposition of precious metals like Gold, Rhodium, Platinum, Palladium & Non-ferrous metals like Chromium, Nickel, Copper, Tin, Cobalt & Zinc.
- Production of Chlorates, Perchlorate, Chlorine / Caustic, Hypochlorite.
- Electrolytic production of chromic acid and Hydrogen from water.
- Electrochemical Cleaning of electronic components.
- Electro chemical Electro-galvanizing of Steel Strip.
- Electrolytic metal recovery.
- Electrophoresis.

Products

- Engineering Equipments
  - Titanium Marine Chiller Coils
  - Steel Processing
  - Centrifugal Pumps, impellers
  - Ti, Zr, Ni, Nb, Ta Shell Tube Heat Exchangers
  - Caustic Fusion Elements
  - Aqua Heaters

- Metal Finishing Equipments
  - Platinized Titanium and Niobium Anodes
  - Titanium Anode Baskets
  - Electric Heaters
  - Heat Exchanger Coils
  - Titanium Jigs and Fixtures
  - Zirconium Heat Exchanger Coils

- Aerospace Equipments – Titanium.
- Tantalum
  - Tantalum, Niobium Equipments
  - Thermowell (sleeves)
• Tantalum repair kit
• Tantalum Washers, Bolt and Nuts
• Tantalum Bayonet Heaters
• Tantalum Boats

• Recoating/Refurbishment

**Anodes**

**Platinized Titanium anodes** take advantage of the low consumption rate and high current density. Voltages in excess of 10 Volts will result in severe pitting of the titanium core causing premature failure.

**Platinized Niobium / Tantalum anodes** also take advantage of the properties of platinum, but avoid the low driving voltage restriction of Platinized titanium anodes. Breakdown of the niobium oxide film occurs at approximately 120 Volts. Thus these anodes are used where high driving voltage is required. Platinized anodes are quite expensive but have an extremely long life. They are therefore an economical choice for critical applications.

**Mixed Metal Oxide anodes** consist of a high purity titanium substrate with an applied coating consisting of a mixture of platinum group metal oxides. The titanium serves as a support for the oxide coating. The mixed metal oxide is a crystalline, electrically conductive coating that activates the titanium and enables it to function as an anode. When applied on titanium, the coating has an extremely low consumption rate, measured in terms of milligrams per year. As a result of this low consumption rate, the metal dimensions remain nearly constant during the design life of the anode - providing a consistently low resistance anode.

**PT ANODE**

*Platinized Titanium Anode : Platinized Niobium Anode*

Platinum, Palladium, Rhodium, Ruthenium, Iridium and Osmium are found as a part of Platinum Group Metals (PGM's). Pure platinum is a tin white metal, it is malleable ductile, and harder than silver. It does not tarnish in air and dissolve in acid.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melting point</td>
<td>1768°C*</td>
</tr>
<tr>
<td>Boiling point</td>
<td>3827°C</td>
</tr>
<tr>
<td>Density</td>
<td>21.37g/cm³</td>
</tr>
<tr>
<td>Thermal conductivity</td>
<td>72Wm⁻¹K⁻¹</td>
</tr>
<tr>
<td>Vickers hardness in annealed state</td>
<td>41</td>
</tr>
<tr>
<td>Thermal expansion coefficient</td>
<td>8.8×10⁻⁶°C (20-100°C)</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>123MPa</td>
</tr>
<tr>
<td>Elongation</td>
<td>40%</td>
</tr>
</tbody>
</table>

* Value converted to ITS-90.
Platinum is depositing on titanium, niobium, molybdenum, stainless steel, brass, aluminum & copper by electro deposition process. In electrochemical application, Niobium is selected as substrate, when the resistivity of titanium is too high or its breakdown potential is too low. Platinized niobium is preferred for high current application.

**Specification & Limitation of Platinized Titanium and Niobium anode**

<table>
<thead>
<tr>
<th>Description</th>
<th>Platinized Titanium Anode</th>
<th>Platinized Niobium Anode</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH level*</td>
<td>Between 1 and 12</td>
<td>Between 1 and 10</td>
</tr>
<tr>
<td>Platinum layer thickness*</td>
<td>2.0 - 10 µ or as desired</td>
<td>0.5 ~ 10 µ or as desired</td>
</tr>
<tr>
<td>Maximum content of fluorides in electrolyte*</td>
<td>50 mg/l</td>
<td>500 mg/l</td>
</tr>
<tr>
<td>Maximum allowable current*</td>
<td>50 A/dm²</td>
<td>100 A/dm²</td>
</tr>
<tr>
<td>Maximum allowable operating voltage</td>
<td>12</td>
<td>40</td>
</tr>
<tr>
<td>Consumption rate in sea water</td>
<td>8 ~ 16 mg / Ay</td>
<td>8 ~ 16 mg / Ay</td>
</tr>
</tbody>
</table>

* The above will need to be adjusted depending on application.

**Applications**

1. Impressed Current Cathodic Protection
   - Seawater structures.
   - Fresh Water structures.
   - Brackish water structures.
   - Sand.
   - Concrete.
   - Application with coke fill.

2. Electroplating of…
   - Au, Ag, Rh, Pt, Pd and Ru.
   - Chrome
   - Cu, Zn, Ni and Sn
   - Printed circuit boards and
   - Equalization of cathode and or anode current efficiency.
3. Electro winning of…
   - Copper,
   - Nickel
   - Cobalt mining.

4. Recovery of Heavy Metals from…
   - Waste plating baths
   - Rinsing solutions.

5. Electroforming:
   - Dentistry industry like… crowns, bridges and inlays
   - Hollow jewelry
   - Microstructures

6. Electrochemical Synthesis of…
   - Electro-oxidation of Cr(III) to Cr(VI)
   - Electro-oxidation of Mn(II) to Mn(VII)
   - Oxo and peroxo compounds
   - Detoxification of harmful substances

**MATERIAL SELECTION GUIDE**

We can provide a Material Selection Guide, or help you with the selection of the right one for your specific application.
Turnkey Projects

- Sodium Chlorate [NaClO₃]
- Potassium Chlorate [KClO₃]
- Sodium Per-chlorate [NaClO₄]
- Potassium Per-chlorate [KClO₄]
- Ammonium Per-chlorate [NH₄ClO₄]
- Sodium Bromate [NaBrO₃]
- Potassium Bromate [KBrO₃]
- Sodium Iodate [NaIO₃]
- Potassium Iodate [KIO₃]
- Calcium Chloride [CaCl₂]
- Sodium Hypochlorite (0.8 %)
- Chlorine Dioxide [ClO₂]
- Dinitrogen Pentoxide [N₂O₅]