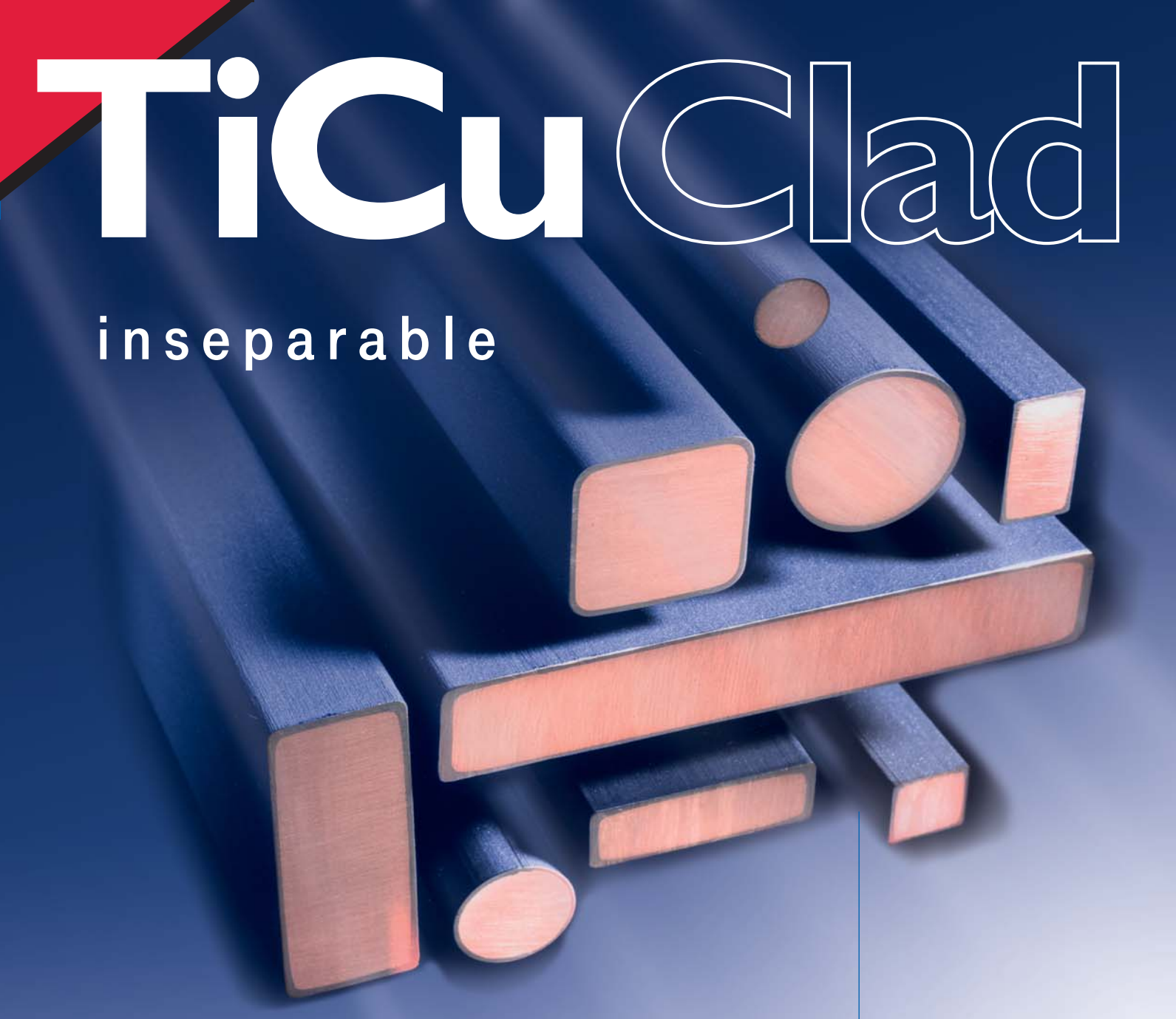
TiCu Clad

inseparable



- Dimensionally stable anode in chlor-alkaline-electrolysis
- Current supply in tinning lines for steel strips
- Current supply in galvanizing lines for steel strips
- Current supply in electrolysis plants/metal recovery
- Coated titanium anode for chromium-plating
- Electrode for cathodic corrosion protection

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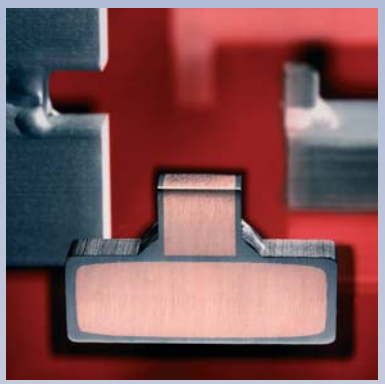
Udo Plante GmbH

Titanium Clad Copper
Consulting & Sales

Over 30 years of experience

Since more than 30 years we have experience in the production of titanium cladded copper bars by compound extrusion. This technique was co-developed by us and perfected. It guarantees an optimal metallurgical bondage between copper core and titanium mantle.

The TiCu Clad material is generally used in electrochemistry, in chlor-alkaline electrolysis, in galvanizing lines, in chromium-plating baths and wherever high corrosion protection and high current-carrying capacities are required.



Quality

Applications

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TiCu Clad for the enviroment

Due to increasingly more strict environmental requirements as well as expensive waste disposal the market demands more environmentally friendly technologies.

For example: TiCuClad anodes have a distinct advantage allowing a more environmentally friendly hard- and bright chromium-plating in fluoride free electrolytes by avoiding the production af hazardous waste like lead chromate which is usually produced by chromium plating in sulphuric acid electrolytes!

Product tests

The application of high quality TiCuClad compound material is even highly economical: No extraordinary disturbances will arise and the life time ist multiple times higher than using non-compound material!

Torsion test

The quality of Clad materials can be demonstrated with a torsion test. During this test strips of the material are taken out of the bond zone and twisted around their own axis several times. Clad materials of high quality must not demonstrate any separation of material after the test. TiCu Clad is a metallurgical Clad material of high quality where no impairment of the bonding materials will occur.

Based on the results of the torsion test, TiCuClad can even be used with relatively small bending radii. Both cold and hot bendings can be optimally carried out.

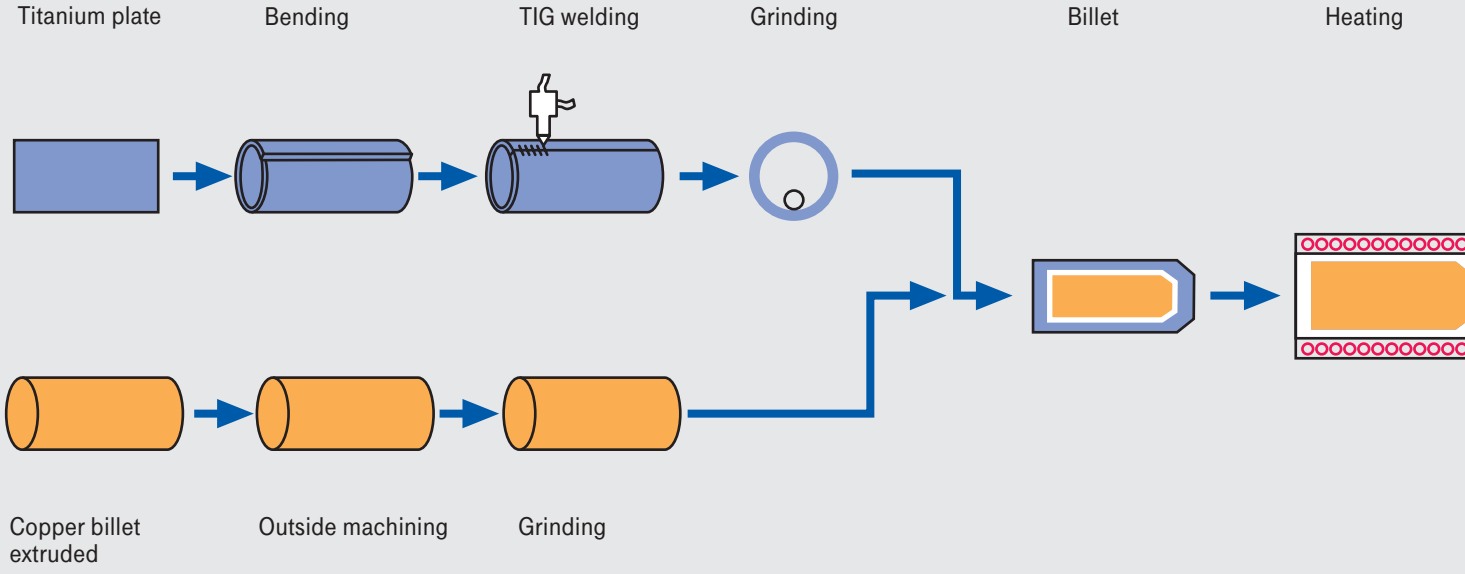
Thermal shock test

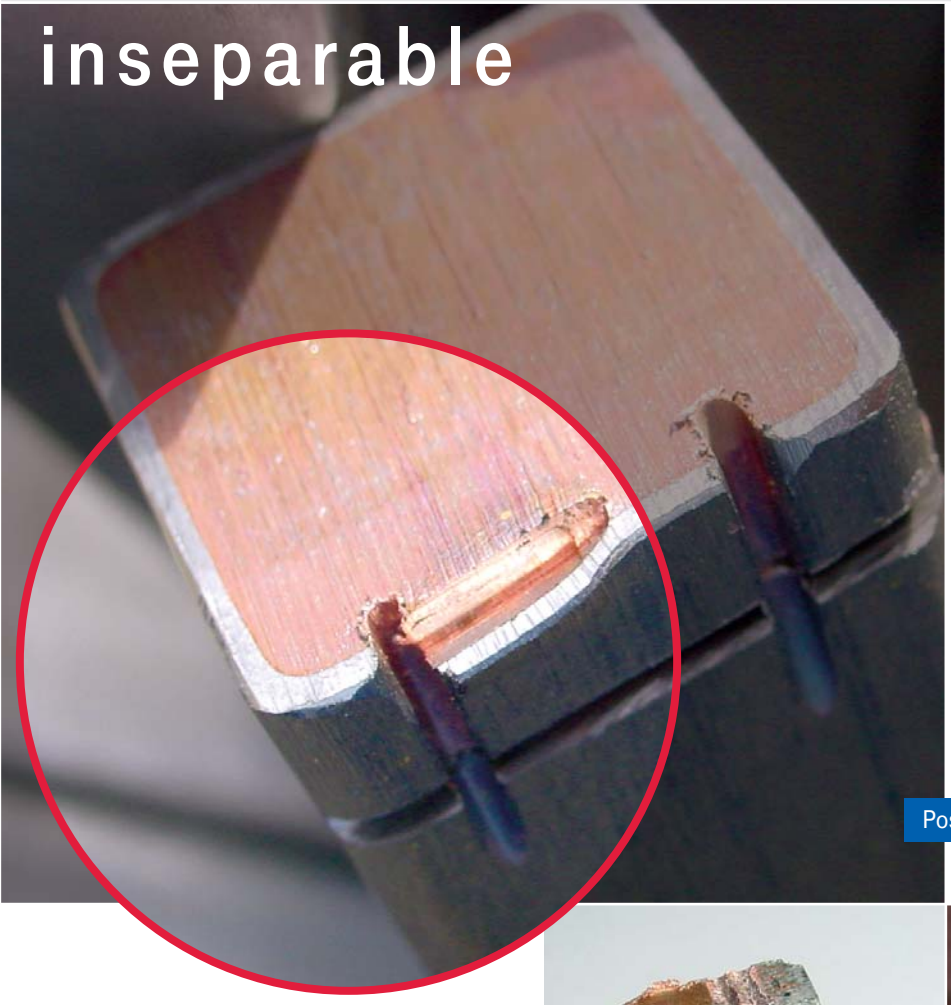
During the test process, a sample is annealed at a temperature of 520 °C for a period of one hour and then subject to water quenching in a basin. This process is repeated up to forty times.

The tests of TiCu Clad do not show any impairment regarding quality of the metallurgical bond.

As a result, the Clad material bars can be directly coated with iridium, platinum or mixed oxides, since this process requires thermal treatment with many cycles at high temperatures.

Manufacturing process





Split test

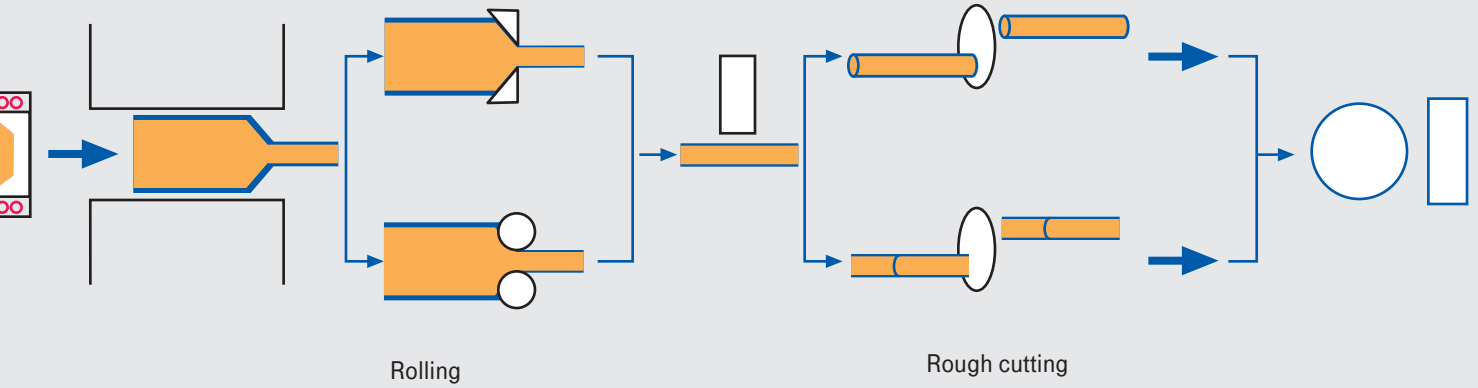
The so-called split test is a fast and proven method to an overall quality test.

The purpose of the split test is to try to separate the titanium layer from the copper core using a small hammer and a chisel.

A high-quality metallurgical bond deforms, but the titanium layer does not separate from the copper core.

Positive result

Negative result



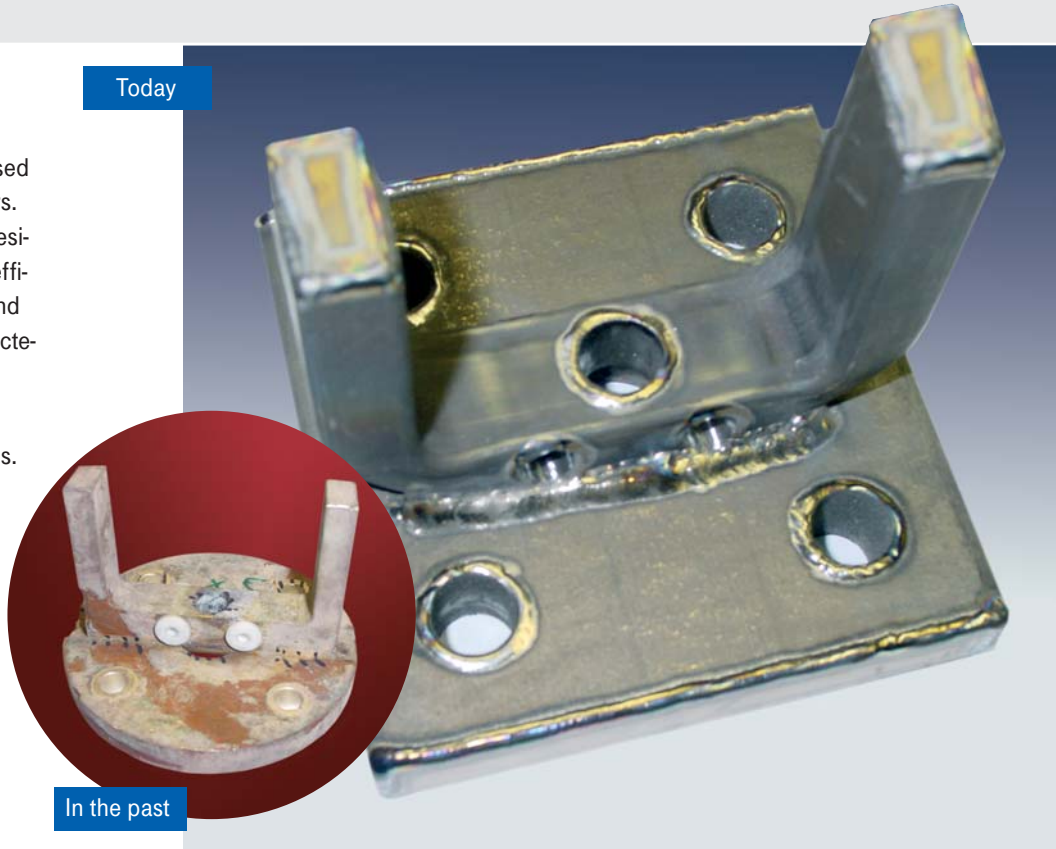
Ultrasonic testing

The ultrasonic testing has been successfully used as a means of quality control in the recent years. Certain types of defects such as cracks or adhesion problems can be detected due to a higher efficiency of the testing techniques. The ultra sound immediately provides information on the characteristics of the bond.

The sound beam of the ultrasound propagates like light due to the quasi-optical characteristics.

Diffraction phenomena only then occurs when the obstacles causing them are the same size as the waves. Ultrasonic waves are hardly absorbed by metals. The reflection characteristic of sound waves appearing at interfaces as well as at defects, are investigated.

A voltage drop is not to be expected due to the excellent metallurgical bond of TiCu Clad.



Further processing

The Clad material is so strong that the Clad titanium can be welded with other titanium components by tungsten-inert gas welding (TIG-welding), laser or spot welding without damaging the compound.

Connection for power supply

The professional connection to the power supply is a constantly recurring question in dealing with titanium Clad copper bars.

Electrical specialists often plead for the removal of the more poorly conducting titanium from the the contact surfaces.

In order to guarantee optimal current transfer, the connection surfaces are cleaned of titanium by milling or turning. This is a correct method with respect to the electrical conductivity of copper (58 mS) compared to titanium (2.2 mS).

This means that a copper wire with a length of 58 m and a cross section of one square millimeter has a resistance of one Ohm. With titanium the resistance of one Ohm is already achieved at a length of 2.2 m.

However practice shows that environmental influences must be taken into consideration.

When the contact surfaces are cleaned of titanium, the copper is now exposed to corrosive media like aggressive acids, steams and condensates in the galvanic treatment.

The copper then gradually corrodes resulting in point contact on the contact surfaces and bad current transfers.

Due to these experiences the time-consuming and costly titanium bond is no longer removed with today's connection techniques but used as high-quality corrosion protection.

In the past

Today

What about voltage drop and resistance ?

If a voltage drop is calculated, then only the plating thickness of the titanium (0.5 – 2 mm) as the length is included in this calculation. The result is a very low electrical resistance and from that follows a very low voltage drop. With a plating thickness of 0.5 mm the voltage drop is often only in the mV range.

The costs arising through this voltage drop are considerably lower than those arising through corrosion damage on uncovered connections at the TiCu Clad current supplies of the anodes.

Material and Standards

Coat	**titanium, material-No. 37025 or 3.7035, DIN 17850, ASTM B 265 Grade 1 or 2**
Core	**material acc. to EN 13601, CU-HCP, CW021A, ANSI / ASTM B 244, UNS No.C 10300**

Electrical conductivity

Cu-HCP ≥ >99 % IACS 58 MS/m

Bearing dimensions

Form	Dimension in mm	Dimension in Zoll (inch)
Round	6,35 – 44,45 mm	1/4 - 1 3/4“
4-kt	up to 38 mm	up to 1 1/2” x 1 1/2
Rectangle – flat	up to 20 x 120 mm	up to 0.8" x 4 “
Wire	0,75 – 6,35 mm	0,030" – 1/4"

Other dimensions on request

TiCu Clad Copper can be cut to length depending on customer’s request.

Further Clad materials

Compound extrusion pressed bars sheets
Zirconium Clad copper
Niobium Clad copper
Nickel Clad copper
and a lot of others

Explosion-platinated
Zirconium – Copper
Niobium – Copper
Nickel – Copper
Titanium – Copper

Material	Electrical conductivity in mS/m
Titanium / Cu on titanium	2.153
Titanium grade 2 1.5 mm sheet	2.110
Titanium grade 2	2.240
TiAl VT 01 12.7 x 6.3 mm	1.645
TiAl VT 01 25.4 x 12.7 mm	1.819
TiAl6V4	0.58
Copper	58.0
CuCoBe	30.0
CuCrZr	49.0
W/Cu 75/25	19 – 24.0
CuP6	4.0
Al	28.65
AlMgCuPb	20.45
Stainless steel	1.3

General information

Relation to copper

Titanium	1 : 26 at 20° C
	1 : 66 at 400° C
Stainless steel	1 : 42
TiAl6V4	1 : 100

before

Services/Repair

Repair of all type of TiCu Clad current busbars, e.g. hockey sticks.

Repairs of “older generation” power supplies are also possible depending on how advanced the corrosion is. These can be repaired at low costs and will maintain their functionality.

after

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