The Titanium

HISTORY

Titanium was found (but not isolated) almost at the same time in England and in Germany. In 1791 William Gregor (1761-1817), a clergyman and amateur chemist, discovered a gun powder-like type of sand and found a reddish brown calx he could not identify during research he was carrying out on sands from a local river in Menachan Valley, Cornwall, England. Independently from Gregor's work, renowned chemist Martin Heinrich Klaproth discovered the element in rutile, in 1795, four years after Gregor's discovery. He named the element Titanium.

Isolating Titanium would remain difficult for almost a century. Many failed attemps were made by renowed scientists, amongst which Klaproth himself. J. J. Berzelius isolated it in a very impure state in 1825. In 1887 Titanium was isolated (95% pure) by Lars Nilson and Otto Pettersson. Henri Moissan disvovered a procedure that got him to 98% purity. Finally, in 1910 Matthew A. Hunter from the Rensselaer Polytechnic Institute in cooperation with the General Electric Company, isolated a 99,9% pure sample.

The metal remained a curiosity until 1946, when William J. Kroll of Luxembourg showed that Titanium could be produced commercially. The method he developed is still widely used for Titanium metal production today and Kroll is recognized as the father of this modern industry.

NAME

The element's name, chosen by Klaproth, derives from Greek myths. According to Greek mythology: the Titans were children generated by Earth (Gea) and Heaven (Urano). For a long the all terribly powerful Titans reigned the world.

Here's Klaproth's explanation for his choice of the name Titanium:

"Whenever no name can be found for a new fossil which indicates its peculiar and characteristic properties (in which situation I find myself at present) I think it best to choose such a denomination as means nothing of itself, and thus can give no rise to any erroneous ideas. In consequence of this […] I shall borrow the name for this metallic substance from mythology, and in particular from the Titans, the first sons of the earth. I therefore call this new metallic genus Titanium."

With its unusual strength, the metal Titanium certainly fits its name.

CHEMICAL ELEMENT

In the periodic table the chemical element Titanium has Ti for its symbol and 22 for its atomic number. Titanium is strong, light, lustrous, white-metallic, corrosion-resistant metal. It is used in white pigments and in strong light-weight alloys.

In nature, Titanium is not found unbound to other elements, but the metal is the ninth most abundant element in the Earth's crust (a 0.6% of the total mass). It is present in most igneous rocks and in sediments derived from them.

Significant Titanium deposits are found in Australia, , North-America, Scandinavia, Malaysia and China.

Titanium occurs in the minerals rutile, ilmenite, and sphene, and is present in titanates and in many iron ores. It is present in plants, in the ashes of coal, even in the human body.

Titanium can also be found in meteorites and even in the sun. Rocks obtained brough back with the Apollo 17 lunar mission showed presence of 12.1% TiO2.

PROPERTIES

The commercial succes of Titanium is a result of its physical and mecanical characteristics. Titanium is strong, light, easily fabricated and, in a pure form, very ductile and easy to work.

The corrosion resistance of Titanium is extraordinary (Titanium is almost as resistant to corrosion as Platinum). The metal is not affected in any way by atmospherical corrosion and defends itself perfectly against many forms of climatic or industrial pollution. Titanium is protected by an oxide film. This film forms itself spontaneously on the surface of the material and is very stable in almost all atmospheric conditions. In case a mechanical action (scratches for example) should damage the film, it "repairs" itself, closes like a wounded skin.

Titanium weighs 60% more than aluminium, but is double as strong. The metal is as resistant as steel, but 45% lighter.

Pure, the material is extremely strong, but in the presence of impurity, even in minimum quantities, Titanium gets fragile and hard to work.

In its pure form it is very easy to mould. At approximately 1650 °C Titanium melts. It boils at 3260 °C. Its relative density is 4,5 g/cm3 (against a relative density of steel of 7,9 g/sm3). Its atomic weight is 47,90 amu. Unlike other metals, Titanium is not magnetic. It has a significant noise damping capacity.

Very curious is the metal's "memory of form", its capacity to return in a form it was formerly shaped in.

TITANIUM USES

Its biocompatibility, its capacity to stop growth of micro-organisms and its mechanical resistance make Titnanium an excellent material for medical implansts as pace-makers and dental or orthopaedic prothesis. Titanium is used for heart valves, artificial hips and joints. It is also used in surgery equipment and to manufacture wheelchairs.

Because of its mechanical resistance, its lightness and its stainlessness Titanium is used for missile and space technology, to build aircrafts and helicopters. For the manufacturing of a commercial

transport jet, between 3.500 and 12.000 kg of Titanium is used. For a supersonic transport much more is used: between 14 to 45 metric tons of the material.

Titanium withstands saltwater and atmospheric corrosion and this explains tits extensive use for the building of submarines and other seaships.

Titanium has made space exploration possible. The Apollo capsules were made largely of Titanium and many parts of the Space Shuttle are made of the metal.

The metal is used for the production of engine parts, portable computers, car accessories, sports equipment (golf clubs, tennis rackets, bicycles or underwater sport equipment) or for ultra-light photo equipment.

Because of its beauty, its lightness, its mechanical resistance against atmospheric pollution and the possibility to use the metal in very thin plates, Titanium is an ideal building material (even though its cost is relatively high). The almost 40.000 m2 surface of the Guggenheim Museum of Bilbao are covered with 0,38mm thin plates (a project of the Californian architect Frank O. Gehry).

The fact that Titanium hardly expands under the influence of heat makes (its physiological inertness) it possible to operate the material for the restauration of works of Art or Architecture: the Parthenon, the Trevi Fountain and the Traian Column in Rome, the Church of Santa Cristina in Turin, the Fontana Maggiore of Perugia, part of the Basilica of saint Francis in Assisi that crumbled in a major earthquake a few years ago.

Because of its lightness and its mechanical resistance, its beauty, the possibility to colour the material, Titanium is ideal for the manufacturing of jewelry and of exclusive design furniture.

Titanium dioxide (TiO2) is widely used for house and artist's paint: the material has a good covering power and is permanent. Also, Titanium paint is a terrific reflector of infrared rays and it is extensively used in solar observatories where because of the heat visibility is very poor. The use of TiO2 is also very common in the production of pigments for plastics and rubber, paper, cosmetics, textiles, ceramics and glass.

TITANIUM & GIANNELLI

The new line of Giannelli TITANIUM silencers is designed to offer the same resistance and durability as the stock exhaust, while reducing of about 50% the weight. Fitting a Giannelli TITANIUM pipes will increase the performance of your bike throughout the whole power curve. Our TITANIUM exhaust come in two versions: STREET LEGAL

EEC-HOMOLOGATED or RACING.

The EEC-HOMOLOGATED silencers have an oval profile and are available in the high-mount and low-mount version. The cone-shaped internal is made of high quality stainless steel of reduced thickness, welded using the classical T.I.G. process. The core is covered by top quality sound absorbent material, that reduces noise emissions, keeping the noise level within limits established by European law. The silencers are of the same design as the ones our riders use in the World and AMA Superbike and SBK & Superstock competitions in the last years and so is the production process. The only difference between the two lies in the homologation number that is laser-printed in the silencer's end cap. Our EEC-HOMOLOGATED exhausts have a built-in extractable dB-killer. The dB-killer (At Giannelli we call it the "candle" because of the slight resemblance with a real candle) can easily be taken out, transforming the exhaust from STREET-LEGAL into RACING, for use on the race track only. In case you need to go out in the streets again, you simply put the "candle" back in, nothing's easier (*).

Giannelli's Oval section TITANIUM RACING silencers are the result of the know-how acquired on the the race tracks of the world and are built with technologically advanced materials. As is the case with the HOMOLOGATED Titanium exhausts, there is a weight reduction of about 50% compared to the stock pipes and a noticeable power increase along the whole power curve. The components of our RACING silencers are assembled by TIG and MIG welding. The use of top quality Titanium guarantees great durability, even with in the most extreme conditions. The Titanium RACING exhausts are available both in a high and in a low version.

(*) attention: taking out the dB-killer from inside the pipe a noticable power increase will be obtained, but the exhaust will loose its homologation characteristics.

GIANNELLI SILENCERS S.p.A.
Export Department