A Guide To Titanium Grade 2

What is Titanium Grade 2?

Titanium Grade 2, also known as commercially pure titanium (CPTi), is a remarkable metal consisting solely of titanium, without any other elements. With its unalloyed composition, it boasts an impressive titanium content of 99.2%. In addition, it contains 0.25% iron, 0.03% carbon, 0.08% oxygen, and 0.015% nitrogen. This unique combination of elements gives Titanium Grade 2 its exceptional properties and makes it the most versatile and widely used grade in various industrial applications.

Notable for its relatively lightweight, Titanium Grade 2 offers remarkable strength, ductility, and ease of formability. This makes it ideal for diverse processes such as welding, hot forging, and extrusion. Its remarkable properties and ease of manipulation make Titanium Grade 2 a highly sought-after metal in industries where performance, reliability, and quality are paramount.

Titanium Grade 2 Bars Composition

Grade 2 Titanium Bars are composed primarily of titanium, with small amounts of iron, oxygen, carbon, and other trace elements. UNS R50400 Bars has unique composition gives it excellent corrosion resistance, making it suitable for harsh environments where other metals corrode quickly.

Grade	C	N	O	H	Ti	Fe
Titanium Gr 2	0.10 max	0.03 max	0.25 max	0.015 max	bal	0.30 max

Grade 2 Titanium Bars Physical Properties

Titanium grade 2 bars have a density of 4.51 g/cm3, about 60% of the density of steel. This makes ASTM B348 UNS R50400 Bars an ideal material for lightweight applications. It also has a melting point of 1660°C and a boiling point of 3260°C, which means it can withstand high temperatures. DIN 3.7035 Pipes has a shiny metallic appearance and is non-magnetic, which makes Alloy Grade 2 useful in certain electronic and medical applications.

- Density: 0.163 lbs/in3, 4.51 g/cm3

- Mean Coefficient of Thermal Expansion, in/inl° F (mm/ml° C):
- 70 – 212 ° F (20 – 100 ° C): 4.78 x 10-6 (8.6)
- Thermal Conductivity: BTU-in/h-ft-° F (W/m-° K):
- At 70 ° F (21 ° C): 114 (16.4)
- Modulus of Elasticity, ksi (MPa)
- 2 x 103 (105 x 103) in tension
- Melting Point: 3040 ° F (1670 ° C)

Astm b348 Bars Mechanical Properties

Grade 2 Titanium Round Bars have a tensile strength of 352 MPa and a yield strength of 275 MPa. Grade 2 Ti Bars has good flexibility and can easily form into different shapes and sizes. Its fatigue strength is also high, so it can withstand repeated stress without breaking down.

Density	Melting Point	Tensile Strength	Yield Strength (0.2%Offset)	Elongation
4.5 g/cm3	1665 °C (3030 °F)	Psi – 49900 , MPa – 344	Psi – 39900 , MPa – 275	20%

Equivalent Grades for Grade 2 Titanium Round Bar

STANDARD	WERKSTOFF NR.	UNS
Titanium Grade 2	3.7035	R50400

DIN 3.7035 Bars Uses

ASME SB 348 gr 2 Titanium bars are used in various applications, including aerospace, marine, chemical processing, and medical fields. It is used in aircraft engines, airframes, and other components that require lightweight yet strong materials in the aerospace industry. Titanium UNS R50400 Bars is used in implants, surgical tools, and equipment in the medical field due to its biocompatibility and strength. ASTM B348 Bars is also used in chemical processing equipment, heat exchangers, and other applications requiring corrosion resistance and high temperatures.

Alloy Grade 2 Bars Heat Treatment

Titanium Gr 2 bars can be heat-treated to improve their mechanical properties. Annealing or solution heat treatment can improve elasticity, while precipitation hardening can increase strength. However, care must be taken during heat treatment as excessive heat can cause it to lose its corrosion-resistant properties.

UNS R50400 Bars Corrosion Resistance

One of the primary reasons DIN 3.7035 Bar is so popular is its excellent corrosion resistance. It is highly resistant to seawater, chlorine, nitric acid, and other harsh chemicals. This makes WERKSTOFF NR. 3.7035 Bars an ideal material for use in corrosive environments, such as marine and chemical processing industries.

Titanium Gr 2 Rod Production

Why is Titanium Grade 2 in High Demand?

Titanium Grade 2 is renowned for its exceptional properties that make it highly sought after in numerous industries. Its outstanding corrosion resistance and impressive strength-to-weight ratio make it an ideal choice in the medical implant sector. This remarkable metal is extensively used for manufacturing bone plates, screws, and dental implants, contributing to the advancement of medical technology and improving patient outcomes.

Not limited to the medical field, Titanium Grade 2 also finds significant applications in the military and aerospace industries. Its remarkable lightness and strength make it a valuable material in constructing aircraft structures, missile components, and spacecraft. The reliability and durability of Titanium Grade 2 make it an indispensable choice for these critical applications, ensuring the safety and performance of aerospace and defense systems.

Beyond the medical, military, and aerospace sectors, this versatile metal is vital in various other industries. In the chemical industry, it is valued for its resistance to corrosive environments, while in the industrial sector, it finds use in equipment and machinery that require durability and longevity. The marine industry benefits from its ability to withstand harsh saltwater environments, and the automotive sector relies on its lightweight properties to improve fuel efficiency and overall performance. With its

wide range of applications, Titanium Grade 2 has established itself as an indispensable material in various fields, contributing to advancements in science, technology, and innovation.

Difference Between Grade 2 Titanium and 316L Stainless Steel

Basics

Let's start by understanding the basics of each material. Grade 2 titanium is a type of metallic element that is lightweight, strong, and corrosion-resistant. It is commonly used in the aerospace and marine industries. On the other hand, 316L stainless steel is a type of stainless steel that contains molybdenum and low carbon. It has better corrosion resistance than other stainless steel materials, making it ideal for medical applications.

Strength and Durability

Grade 2 titanium and 316L stainless steel are excellent choices for strength and durability. Grade 2 titanium is incredibly strong for its weight and can withstand extreme temperatures. Meanwhile, 316L stainless steel is tough and highly resistant to corrosion and wear. However, it's important to note that both materials have strengths and weaknesses depending on the application.

Biocompatibility

Biocompatibility refers to a material's ability to interact with the human body without causing harm. When it comes to medical implants, biocompatibility is of utmost importance. Grade 2 titanium is an excellent choice for implants because it is biocompatible, non-toxic, and corrosion-resistant. 316L stainless steel, on the other hand, may not be the first choice for implants, but it is often used for temporary implants due to its ease of manufacture and affordability.

Cost

Cost is always a factor when choosing a material for a project. Grade 2 titanium is more expensive than 316L stainless steel. However, it is also more lightweight and has better strength-to-weight ratios. It is also more resistant to chemicals and corrosion. Meanwhile, 316L stainless steel is less expensive than titanium but is heavier and less corrosion-resistant. When choosing between these two materials, it's essential to consider the specific project's needs and the budget available.

Application

The application is the final consideration when deciding between Grade 2 titanium and 316L stainless steel. What is the intended use of the material? In aerospace engineering, Grade 2 titanium is often used for parts that require high strength and lightness. Meanwhile, 316L stainless steel is commonly applied in the medical industry, such as surgical tools, medical devices, and implants. While these two materials overlap in their applications, choosing the right material for the intended use is essential.

Difference Between Grade 23 and Grade 2 Titanium

Grade 2 titanium, also known as commercially pure titanium, is a low-strength alloy containing 99.2% pure titanium. It is lightweight, strong, and corrosion-resistant, making it an ideal material for different applications, including aircraft components, medical devices, and prosthetics. Grade 23 titanium, also known as Ti 6Al-4V ELI, is a higher-strength titanium alloy that contains 6% aluminium and 4% vanadium. It is more durable and resistant to wear and tear, making it suitable for applications that require higher strength and toughness, such as aerospace components, orthopaedic implants, and dental implants.

Applications of Grade 23 and Grade 2 Titanium

Grade 2 titanium is widely used in various industries, including aerospace, marine, and medical. It is used to manufacture aircraft parts, heat exchangers, prosthetic devices, and surgical implants. Grade 23 titanium is more commonly used in medical and dental implants and the aerospace and automotive industries. It is used to manufacture dental implants, bone screws, hip and knee replacements, engine parts, and structural components for aircraft.

Benefits of Grade 23 and Grade 2 Titanium

Grade 2 titanium offers several benefits, including excellent strength-to-weight ratio, corrosion resistance, and biocompatibility. These properties make it an ideal material for use in medical implants since it does not react with the human body and does not cause any allergic reactions. It is also lightweight, making it easy to handle and transport. Grade 23 titanium, on the other hand, offers higher strength and toughness, making it ideal for applications that require superior durability and wear resistance. It

also has high corrosion resistance and biocompatibility, making it suitable for orthopaedic and dental implants.

Manufacturing of Grade 23 and Grade 2 Titanium

The manufacturing process of grade 23 and grade 2 titanium involves various processes, including forging, rolling, extrusion, and welding. Grade 2 titanium is typically hot-rolled or cold-rolled to form different shapes and sizes, while grade 23 titanium is forged and heat-treated to enhance its properties. Welding can also be used to join titanium parts, but it should be done carefully to avoid weakening the material's properties.

Cost of Grade 23 and Grade 2 Titanium

Grade 23 titanium is more expensive than grade 2 titanium due to its higher strength, durability, and wear resistance. The production cost of grade 23 titanium is higher since it requires more complex manufacturing processes, such as forging and heat treatment. Grade 2 titanium is more affordable and widely available, making it a popular choice for different industries.

Difference Between Grade 2 Titanium and 6061 Aluminum

Properties

Grade 2 titanium is a lightweight, corrosion-resistant metal often used for medical implants and aerospace applications. It has a low density, high strength, and high melting point, making it extremely durable and capable of withstanding harsh environments. On the other hand, 6061 aluminium is a versatile and weldable metal alloy commonly used in construction, transportation, and consumer goods. It has a good strength-to-weight ratio and is easily machinable, but it is not as corrosion-resistant as titanium.

Benefits

One of the main benefits of grade 2 titanium is its biocompatibility, which makes it ideal for use in medical implants such as joint replacements and dental implants. It is also non-magnetic, which is important for applications such as MRI machines. It also has excellent fatigue and fracture resistance, ideal for high-stress durability applications. As for 6061 aluminium, its benefits lie in its versatility and cost-effectiveness. It is easy to

form and extrude, making it ideal for manufacturing processes, and it is readily available and affordable compared to other high-strength alloys.

Drawbacks

One of the main drawbacks of grade 2 titanium is its cost. Titanium is an expensive material due to its rarity and difficulty in processing. It also requires specialized equipment and expertise, which can add to the cost. Additionally, while it is corrosion-resistant, it can still be affected by chemical exposure, such as hydrofluoric or nitric acid. As for 6061 aluminium, one of its main drawbacks is its susceptibility to corrosion. Unlike titanium, aluminium can be prone to oxidation and corrosion, weakening the metal over time.

Applications

Due to its strength, durability, and biocompatibility, grade 2 titanium is commonly used for medical implants, aerospace components, and marine applications. It is also used for sports equipment such as golf clubs and bicycle frames due to its lightweight and high strength. On the other hand, 6061 aluminium is used for a wide variety of applications, including aircraft and marine components, automotive parts, construction materials, and consumer goods such as cans and utensils.

Difference Between Grade 9 Titanium and Grade 2

Strength

Grade 9 titanium is stronger than Grade 2 titanium, which makes it more resistant to damage and breakage. This is because Grade 9 contains a higher percentage of aluminium and vanadium, which add strength and durability to the alloy. Grade 9 titanium is the strongest titanium alloy that is commercially available.

Corrosion Resistance

Grade 9 titanium has better corrosion resistance than Grade 2 titanium. This is because it contains more aluminium and vanadium, which form a protective oxide layer on the surface of the metal that resists corrosion. This makes Grade 9 titanium ideal for use in harsh environments, such as in the aerospace industry or marine applications.

Weldability

Grade 2 titanium is easier to weld than Grade 9 titanium. However, Grade 9 titanium can still be welded using proper techniques. The key is to use a welding method that produces a low heat input to prevent the alloy from becoming brittle. In general, Grade 2 titanium is more forgiving of mistakes in the welding process.

Cost

Grade 2 titanium is less expensive than Grade 9 titanium. Grade 2 is more readily available, making the production process less complicated. However, the higher cost of Grade 9 titanium is often worth it because of its superior strength and corrosion resistance.

Applications

Grade 2 titanium is commonly used in applications that require good strength but not necessarily the highest strength. This includes medical implants, aerospace parts, and sports equipment. Grade 9 titanium is used in applications that require the highest possible strength, such as aircraft landing gear, high-performance sports equipment, and military equipment.

What materials do Titanium Grade 2, Titanium Grade 3, and Ti-6AL-4V represent respectively?

Titanium Grade 1, Titanium Grade 2, and Titanium Grade 3 are industrial pure titanium. They can be welded in various forms and have good welding performance. The welded joint can reach 90% of the strength of the base metal. Easy to cut with saws and grinders, and has good machining properties. It has excellent corrosion resistance and is used for parts with a temperature below 350℃ and small stress and parts stamped into various complex shapes. Such as thermal power station condensers; marine seawater corroded piping systems, valves, pumps; chemical heat exchangers, pump bodies, distillation towers; seawater desalination systems, platinum-coated anodes; aircraft frames, skins, engine parts, beams, etc.

Ti-6AL-4V is a titanium alloy. Titanium alloy is an alloy based on titanium and added with other alloying elements. Titanium alloy has the advantages of low density, high specific strength, good corrosion resistance, and good process performance. It is an ideal structural material for aerospace engineering.

TC4 has poor stamping properties and good thermoplasticity. Various forms of welding can be performed, and the strength of the welded joint can reach 90% of the strength of the base metal. The machining performance is still good, requiring the use of carbide tools, large cutting speed, slow speed, and sufficient cooling. Good corrosion resistance and good thermal stability. It is one of the most widely used titanium alloys and is used for parts that work under 400℃ for a long time.

Cost Difference Between Grade 1 And Grade 2 Titanium

Grade 1 and grade 2 titanium are unalloyed commercially pure titanium alloys having similar properties. Grade 2 titanium is the warhorse of the titanium grade and is the most abundantly available grade. These alloys in grade 2 are slightly cheaper compared to the softest titanium grade. Grade 2 alloys can be availed between $15 to $17 per kg, while grade 1 alloys are available in the price range of $16 to $18 per kg.

Titanium Grade 2 Standard Vs Titanium Grade 1 Standard

Titanium grade 2 is designated with the UNS R50400, European Standard EN 10204-3.1. It covers standards of ASME SB-348, ASME SB-363, ASME SB-265, ASME SB-381, ASME SB-337, ASME SB-338, ASTM F-67, ASME SB-337 and ASME SB-338

Titanium grade 1 is designated with the UNS R50250, European Standard EN 3.7025. It covers standards of ASME SB-363, ASME SB-381, AMS 4942,ASME SB-337, ASME SB-338, ASME SB-348, ASTM F-67, AMS 4921, ASME SB-265, AMS 4902, ASME SB-337 and ASME SB-338

Difference Between UNS R50250 And UNS R50400

The UNS R50250 specification covers the standard for titanium grade 1 alloys. UNS R50400 specification on, the other hand, covers grade 2 titanium standard.

UNS R50250 is the softest grade of titanium, exhibiting the best formability in the cp range. UNS R50400 is the most widely available cp grade having higher strength than its counterpart.

Titanium Grade 2 Hardness And Weight

Titanium grade 2 are alloys designed with small amounts of oxygen and iron. The non-magnetic grade of components are designed with a hardness of 160-200hv. The grade 2 alloys are lightweight modules that are designed with weights starting at 0.163 lbs /in3. The weight is increased or decreased based on the dimensions of the component

Which Grade Is Better For Surgical Applications Gr 2 Or Gr 1 ?

Grade 1 and grade 2 of Ti alloys have identical properties. However, Titanium Gr 2 has slightly higher strength, making them a better choice for surgical applications. The higher yield strength and anti-corrosion resistance in grade 2 allow them to be utilized for surgical instruments, dental implants, and in rods or pins for prosthetics

What Is Cp Titanium?

CP titanium is unalloyed commercially pure titanium grade. This range is represented by grades 1, 2, 3, and 4 of titanium. These grades of titanium are ordered based on their corrosion and formability. The grade 1 in the cp range has the highest formability with the lowest strength. The higher the grades greater is their strength, while the formability reduces drastically. The major advantage of these components is that they integrate well with the human body.

Titanium Grade 2 Density In Kg/M3 And Weight

Ti Gr 2 is an alloy of titanium exhibiting a lower density and is highly desirable in applications where the concern of weight is of the highest degree. Grade 2 has a density of 4510 kg/m3. The weight of this grade starts at 0.163 lbs /in3, which increases or decreases based on the lengths or diameter of the components.

Titanium Alloy Grade 2 Melting Point And Grade 2 Titanium Strength

Alloy 2 in the titanium grade is the most widely available alloy. The unalloyed Ti has a tensile strength of minimum 485Mpa while exhibiting a minimum yield strength of 345Mpa. It has an elastic modulus between 105-120 Gpa. The grade possesses an excellent melting point of up to 1660 degrees C, making it suitable for high-temperature applications.

Titanium Grade 2 Price Per Kg In India, China And Japan

The most readily available commercially pure titanium grade 2 is available in India at prices of Rs $18 per kilogram. In Japan, the rates are at $21 per kilogram, while inn China, the rates vary between $20 to $21. The rates keep changing from day to day depending on the availability and demand for the product.

Price Of Titanium Grade 2 In Next 5 Years And Difference In Applications Of Ti Alloy Gr 1 And Gr 2

Price Of Titanium Grade 2 In Next 5 Years

During the first half of 2021, the prices of titanium and especially titanium grade 2 shot up due to shortage and rising demands. The resumption of aerospace and chemical sectors, has increased the demand for grade 2 titanium products substantially. With the growing application for titanium in the automotive, aerospace, and chemical industry, the market size of Ti Gr 2 material will reach close to the 10 million range by 2026.

The unalloyed ti grade 2 components have good resistance properties coupled with low thermal expansion escalating their demand in the market. The non-toxic components are utilized in several medical pieces of equipment, from fitting dental implants to hip balls and sockets. Apart from this, the heat resistance and fuel efficiency offered by these components will drive up their demand in the aircraft manufacturing industry in the coming years. All these factors will play a crucial role in increasing the prices of grade 2 titanium in the next 5 years

Plasma Electrolytic Oxidation (PEO) for Titanium

Plasma electrolyte oxidation (PEO)-induced coatings are capable of withstanding more than twice as much wear versus SAE52100 steel (in block-on-ring dry sliding wear tests). They also address the issue of cracking.

The 3-stage coating process is favoured for its comparative flexibility. For example, during the process, the electrolyte bath can be modified for the introduction of new materials in the coating This gives the Titanium materials a bespoke-to-application characteristic that suits the engineer’s design.

The innovation of PEO applications has led to its adoption in the most competitive aerospace, defence, automotive, and medical companies.

Specific benefits for Ti materials undergoing the PEO process includes a reduction to the coefficient of friction from ~0.8 to ~0.4 against steel, which would lessen the damage from galling.

Titanium Grade 2 Manufacturer

Welcome to our world of titanium dioxide production! As a leading manufacturer based in China, we take pride in delivering top-quality TiO2 products to meet your diverse needs. Whether you are in the coatings, plastics, or paper industry, our commitment to excellence ensures that you receive the finest titanium dioxide for your applications.

Our state-of-the-art facilities are equipped with cutting-edge technology and adhere to the highest industry standards. We prioritize quality control at every stage of the production process, ensuring that our titanium dioxide not only meets but exceeds your expectations.