CNPC POWDER

SPECIALIZED IN POWDER MATERIALS

Providing The Best Alternative of Powders

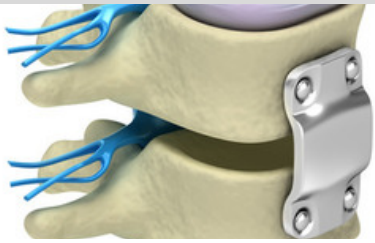
TITANIUM FOR MIM

Titanium is a unique element that has found a very good fit with Metal Injection Moulding. Titanium counts a host of physical properties that make it very useful for a variety of advanced applications. As a raw material, Aerospace finds the largest value for Titanium, while the Biomedical industry is the second largest.

MEDICAL INSTRUMENTS

TI POWDER

TITANIUM BRACKETS



Some of titanium's properties include its high strength, toughness, durability and corrosion resistance, while also enjoying low density and good compatibility with biological materials. This makes titanium great for advanced applications in medical components.

When looking at Titanium for parts production, there are some important benefits for MIM which include:

The titanium-oxygen affinity that make conventional casting and forging difficult does not effect MIM parts.
Titanium is difficult to machine due to high strength and low thermal conductivity. However, MIM reduces or eliminates the high cost resulting from damaged tools and damaged parts. MIM Titanium is able to reach near net shape, and eliminates waste and the need for expensive machining.
These parts can also achieve improved strength and corrosion resistance due to higher density achieved by MIM.

Titanium for Structural Joints

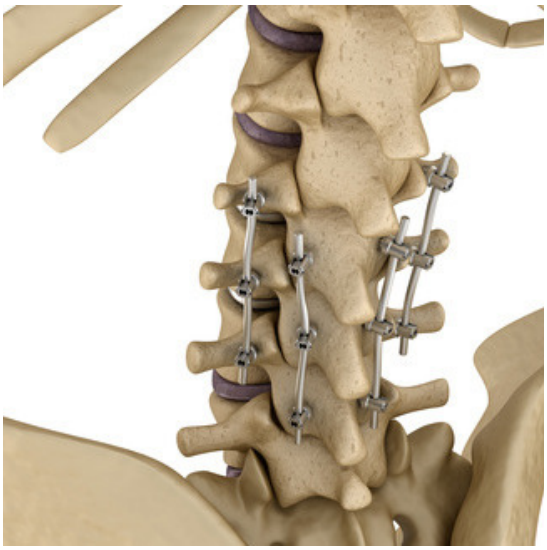
Titanium can be segmented into three applications based on the quality of the powder and production process:

- Ornamental: these items like watches or cases have few demanding physical or mechanical properties.
- Mechanical: these parts like aerospace parts or surgical tools require that mechanical and physical resistances exceed that of other materials like stainless steels.
- Critical: These parts require the unique characteristics of titanium to make lifesaving applications possible, like biomedical implants and critical aerospace components.

Titanium's Main Advantages in MIM

- Low density 4.5 g/cm3
- High strength
- Excellent corrosion resistant at room and low temperatures in air, wet atmosphere and sea water
- High creep resistant
- Wide range of operating temperatures from -196 to 500 Celsius, up to 650 Celsius.

Titanium Bracket



Metal injection molding for the fabrication of medical implants is interesting because of the possibility of generating porous components. These are beneficial with regard to bone in-growth. Pore sizes between 50 and 500 µm are usually considered as adequate, depending on a possible demand for vascularisation of the implant. Instead of applying a second process to coat the implant with a porous layer, as it is done with hip implants, the implant can be manufactured as porous in a single MIM process.

MIM Titanium is primarily controlled by four parameters: Density, Alloying, Interstitial Content, Microstructure. In MIM for Titanium, porosity can degrade mechanical properties, so getting to as close to full density as possible is desirable. In general, lower interstitial levels of Oxygen, Carbon Nitrogen and Hydrogen are desirable. Compositions of MIM Titanium alloys for the most part are the same as wrought grade. Ti-6Al-4V or Ti 6-4 contains 6%Aluminum and 4% Vanadium is certainly most common MIM specific alloy. Due to grain size and the difference in states after sintering, the microstructure is slightly reduced in yield strength relative to wrought grade, but secondary pressing can improve final densification.

Titanium Powders fall into the following Categories: Sponge, Atomization (Gas or Plasma), hydride-milled-dehydride (HDH), and some novel production processes. For Titanium used in MIM there are 4 characteristics that should be looked at to ensure that your powder is of good quality. The powder should be either spherical or sponge with good separation of the particles. The particle distribution should be between 30-60μm or 325 mesh for MIM applications. MIM Titanium should have a high tap density and have interstitial Oxygen and Carbon at 0.15% and 0.04% respectively by weight.

In addition to being separated particles, powders should be pore-free and free of any trapped gas within the particles. MIM grade Titanium has a variety of requirements to meet the specific needs of MIM applications. CNPC POWDER's Titanium powders meet these recommended guidelines, and CNPC POWDER produces a Titanium powder that is designed meet the needs of MIM applications.