BLT

Stock Code:688333.SH

BLTM

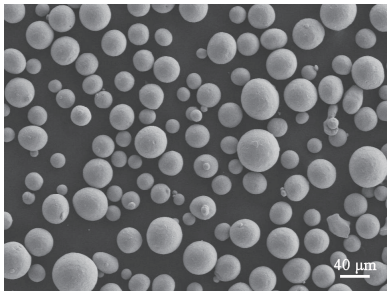
BLT-Ti64

Titanium Powder Designed for Additive Manufacturing

Ti-6Al-4V alloy has fine mechanical properties, biocompatibility and corrosion resistance, and has broad application prospects in aerospace, medical, chemical and other fields. For these applications, BLT has developed and produced high-quality BLT-Ti64 powders suitable for selective laser melting (SLM).

→ Product Features

Advanced Inert Gas Atomization process is adopted to produce BLTM powder. Combined with our optimized powder treatment process, we can provide BLT-Ti64 powder with superior quality in commercial scale.



- Low Oxygen Content
- High Purity
- Excellent Flowability
- Few Satellite Particles
- Highly Spherical
- High Consistency of Every Batch

→ Chemical Composition

BLT-Ti64 powder chemistry comply with ASTM B348, Grade 5, Grade 23.

The chemical composition is in compliance with standards ASTM F1580, ASTM F2924, ASTM F136, ASTM F3001.

	Chemical Composition (wt.%)										
Element	Ti	Al	V	Fe	C	N	H	O	Y	Other Elements	Other Elements
Grade 5	Bal.	5.5~6.75	3.5~4.5	≤0.30	≤0.08	≤0.05	≤0.015	≤0.20	≤0.005	each≤0.10	total≤0.40
Grade 23	Bal.	5.5~6.5	3.5~4.5	≤0.25	≤0.08	≤0.03	≤0.012	≤0.13	≤0.005	each≤0.10	total≤0.40

→ Particle Size Distribution and Powder Properties

Particle Size Distribution [1]	D10≥18μm, 32μm≤D50≤42μm, D90≤63μm
Hall Flow [2]	≤40s/50g
Apparent Density [3]	≥2.2g/cm³
Tap Density [4]	≥2.7g/cm³

【1】Particle Size Distribution test according to DIN EN ISO 3923, ASTM B822.
【2】Hall Flow test according to DIN EN ISO 4490, ASTM B213.
【3】Apparent Density test according to DIN EN ISO 3923-1, ASTM B212.
【4】Tap Density test according to BS EN ISO 3923, ASTM B527.

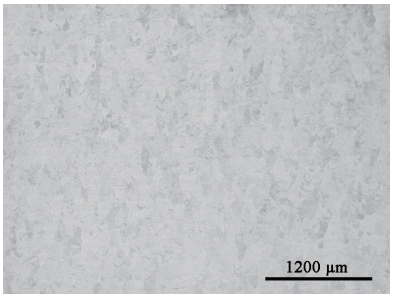
→ Printing and Heat Treatment

The BLT-Ti64 powder should be printed to AM components through selective laser melting process. Heat Treatment is used to optimize mechanical properties of the components and relieve stress. A recommended heat treatment condition is heat to 800 °C in vacuum furnace and maintain temperature for 2 hours, then cooling under argon quenching. This Material Data Sheet of BLT-Ti64 powder provides information and data for components built by BLT-S310.

→ Microstructure of the Printed Components

Porosity

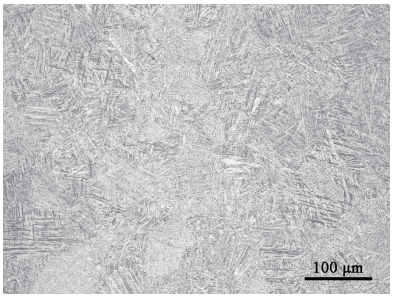
The printed components from BLT-Ti64 powder show a homogenous, dense internal structure. (Porosity≤0.05%)



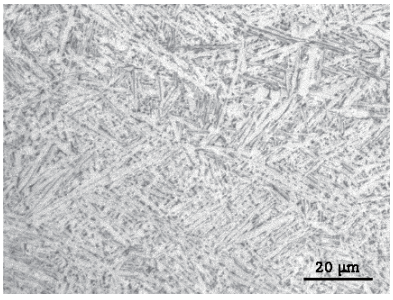
Porosity≤0.05%

Microstructure

Etched samples show a microstructure consist of α phase and β phase, typical for Ti-6Al-4V alloy. As a result of rapid solidification, the α and β phase is fine and distribute homogenously, leading to excellent comprehensive mechanical properties.



Microstructure (x 200 magnification)



Microstructure (x 500 magnification)

→ Typical Achievable Mechanical Properties

Material Properties		Tensile Strength [5] Rm (MPa)	Yield Strength [5] $Rp_{0.2}$(MPa)	Fracture Elongation [5] A %	Reduction of Area [5] Z %	Young's Modulus [5] E (GPa)	Hardness [6] HV0.5
Test Result	(XY)	1000±30	910±30	17.5±2.5	55±5	110±10	320±15
	(Z)	1000±30	950±30	17.5±2.5	55±5	110±10	

【5】Tensile test according to DIN EN ISO 6892-1.【6】Hardness test according to DIN EN ISO 6507-1.

→ Chemical and Physical Properties

Material Properties	Test Result	
Chemical Composition [7]	Ti (balance) Al (5.5-6.75 wt.%) V (3.5-4.5 wt.%) O (≤ 0.20 wt.%)	N (≤ 0.05 wt.%) C (≤ 0.08 wt.%) H (≤ 0.015 wt.%) Fe (≤ 0.30 wt.%)
Surface Roughness（Ra） [8]	<10	
Relative Density（ρ） [9]	approx. 100 %	

【7】Chemical composition analysis according to ASTM E1941-10, ASTM E2371-13, ASTM E1409-13, ASTM E1447-09.
【8】Surface roughness test according to DIN EN ISO 4288.
【9】The relative density is obtained by dividing the measured density by the theoretical density. The measured density test according to DIN EN ISO 3369.

→ Biological Characteristics

Corrosion Resistance

Components were printed by BLT-Ti64 powder. In a standardized test [10], the total metal ion release from each component into the specified solution at (37±1)°C [(98.6±33.8) °F] in a time period of 7d±1h is about 5μg /cm^2.

Tarnish Resistance

The components printed by our BLT-Ti64 powder are considered tarnish-resistant [11], which means when tested in accordance with standard [11] , there is no more than a very minor colour change and the products of tarnish are easy to remove by gentle rubbing or brushing.

Biocom-patibility

Several biological tests were conducted. And the biocompatibility of BLT-Ti64 powder was evaluated according to ISO 10993-1:2009 based on the test results. The test results are as fellows:

Evaluation Tests	Test Result
In Vitro Cytotoxicity [12]	Nontoxicity
Irritation and Skin Sensitization [13]	Nonirritant
Genotoxicity [14]	Negative
Systemic Toxicity [15]	Nontoxicity

【10】Corrosion resistance test according to DIN EN ISO 22674.
【11】Tarnish resistance test according to DIN EN ISO 22674.
【12】In vitro cytotoxicity test according to DIN EN ISO 10993-5.
【13】Irritation and skin sensitization test according to DIN EN ISO 10993-10.
【14】Genotoxicity test according to DIN EN ISO 10993-3.
【15】Systemic toxicity test according to DIN EN ISO 10993-11 and DIN EN ISO 10993-11.

*It should be pointed out that test results listed above only provide to user as a reference.
The producer should evaluate the biocompatibility of the component according to a particular purpose.

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