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# XY Electronics Technology Co.,Ltd

# Content

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# Process of PIM Technology

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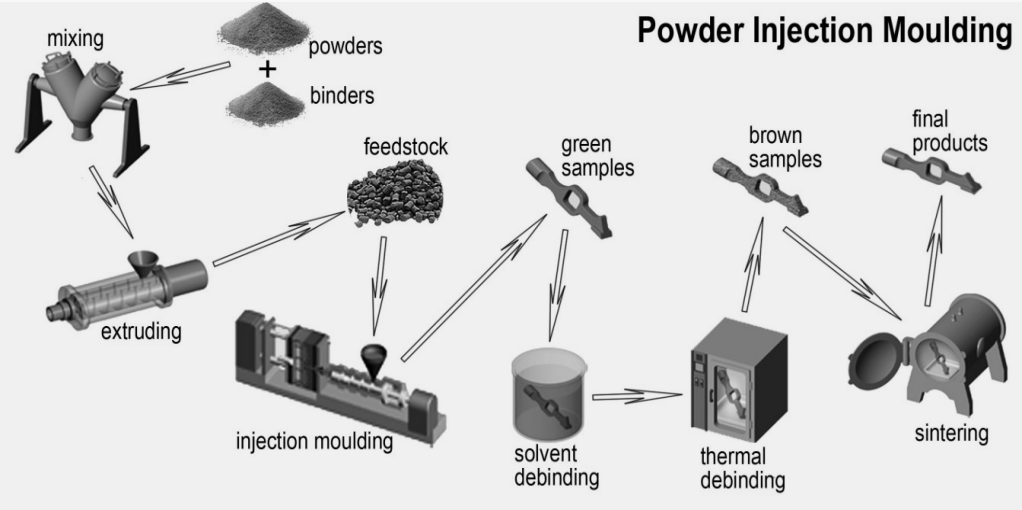


## Advantages of PIM

- Precession, complex 3D structure, tolerance control range is about ±0.3% of the part size;
- Relative density of MIM product is 98%, Mechanical strength and property is very similar to those made by casting and forging;
- New Metal and Ceramic Material Production
- Efficient production
- Materials can be recycled and environmentally friendly

- Metal/ceramic powders and polymeric binders are evenly mixed and pelletized into the feedstock.
- The feedstock is injected into a die cavity in a semi-solid state using an injection molding machine to produce the green part.
- Binder materials are removed from the green part and get the porous brown part.
- The brown parts are placed on ceramic setters which are sintered at a high temperature in an atmosphere-controlled furnace.

# Metal Powder for MIM

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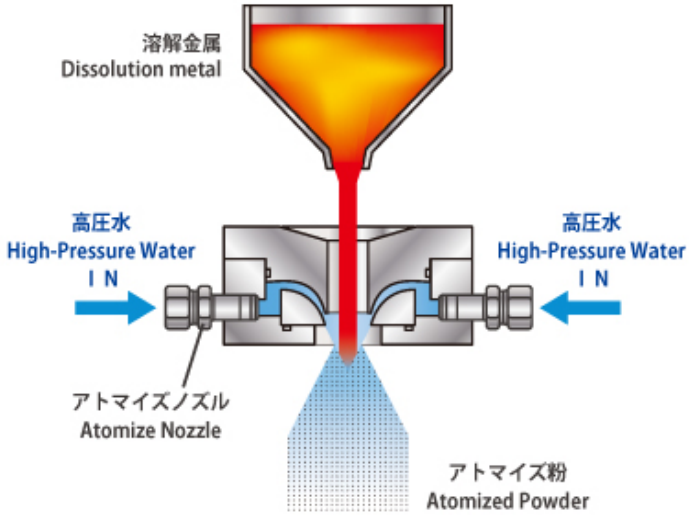
- Stainless steel powder is mainly prepared by atomization
- The atomizing medium is water, gas, water and gas combined




The principle of atomization

## Stainless steel atomized powder features

- The shape is spherical or nearly spherical, and the fluidity is good.
- Typically -500 mesh
- Typical particle size distribution is: D10≈3~5μm; D50≈8~12μm; D90≈20~25μm
- The water atomized powder has a low cost and an ellipsoid shape, and has a good shape retention ability during sintering, but the powder has a high oxygen content and a low sintered density.
- The gas atomized powder has a high cost, a nearly spherical shape, and a poor shape retention ability during sintering, but the powder has a low oxygen content and a high sintered density.

# MIM Feedstock

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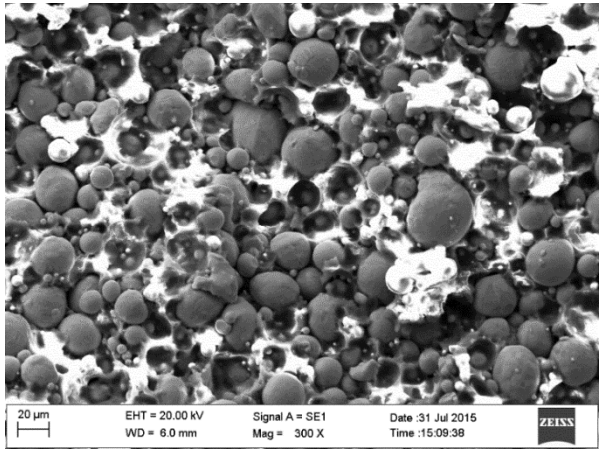
- Three major systems: plastic base, wax base and water base; corresponding to three debinding methods: catalytic debinding, organic solvent debinding and water extraction debinding
- Each of the three major systems has advantages and disadvantages:
  - Plastic base feedstock, good shape retention, high debinding efficiency, but the formula is highly confidential and difficult to imitate
  - Wax-based feedstock, low green strength, slow debinding efficiency, debinding process is relatively friendly to the powder, the formula is relatively simple, but the solvent is difficult to handle, and the recycling cost is high.
  - Water-based feedstock, the performance is similar to wax-based feedstock, but using water as the extraction solvent, environmentally friendly, and the stability needs to be continuously verified.

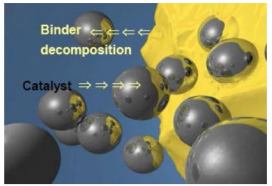
Plastic base feedstock (EP homemade)

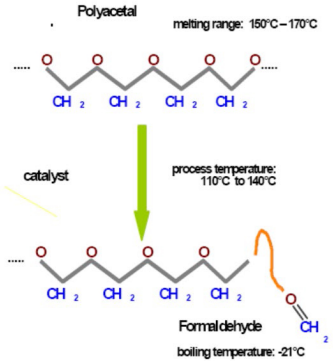



The morphology of the green part after catalytic debinding, the bright white between the powders is the skeleton binder, which is removed during the subsequent sintering process.

# De-binding & Sintering



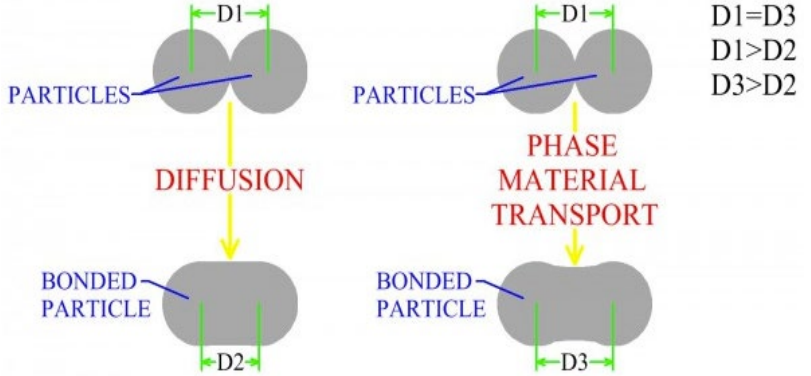



EP catalytic debinding equipment

Catalytic debinding of the binder is a process where most of the binder is attacked by a catalytic acid vapour such as highly concentrated nitric or oxalic acid. ... The acid acts as a catalyst in the decomposition of the polymer binder.

- The purpose of sintering: the conversion of the powder particles into a dense body, the surface energy is reduced
- The main principle is to increase the kinetic energy of the atoms on the surface of the powder particles by heating, atomic migration, and filling the pores between the powder particles, thereby densifying the injected green part.



# New Technology 1:
# Forming technology complementary to MIM

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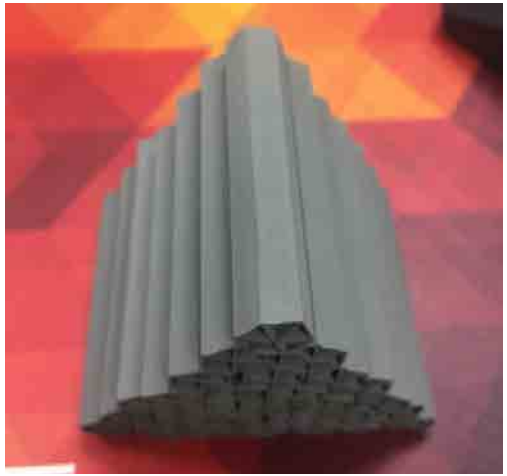

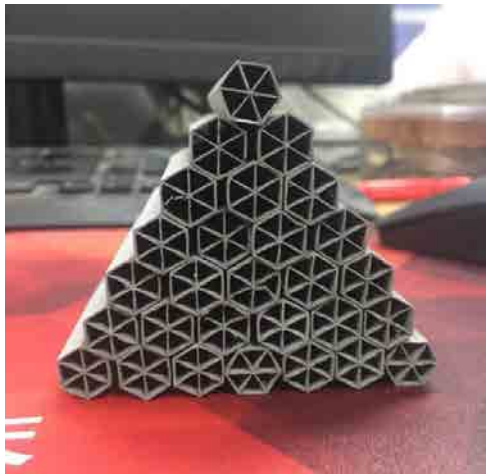

- Developed a new process combining  other process and MIM
- Suitable for manufacturing two-dimensional complex equal sections, and the wall thickness can be as thin as 0.2mm
- Easy to achieve automated continuous production, high production efficiency; excellent material properties, wide range of applications; reduced costs

# New Technology 2:
# Forming technology complementary to MIM – 3D printing + sintering

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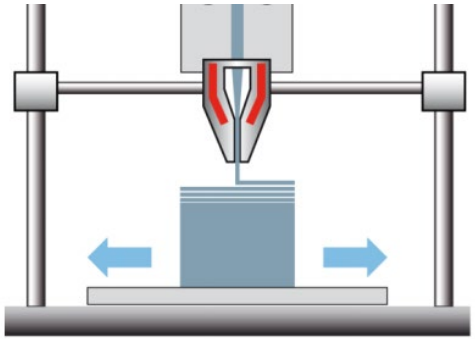

✓ 3D printing principle

✓ 3D printing feedstock

✓ 3D printing green parts

✓ 3D printing sintered part

- Customized products can be customized without the need for molds
- Suitable for products with very complicated shapes, high performance requirements, and small batch sizes
- In some high-end manufacturing fields, such as the medical industry and aerospace, titanium 3D printing combined with MIM materials and sintering advantages have strong market prospects

# New Technology 3:
# Amorphous alloy (Liquid metal)

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- Non-crystalline, and have a glass-like structure
- Good electrical conductivity
- Low shrinkage during cooling, and resistance to plastic deformation
- Better resistance to wear and corrosion
- Higher tensile yield strengths and higher elastic strain limits
- Ductility and fatigue strengths are lower

# MIM assisted process - Liquid Silicone Rubber

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Waterproof SIM card tray

Type-C connector waterproof seal

3C waterproof electronic products

The waterproof silicone ring of the smart phone is mostly formed on the original metal fittings. At the same time, the volume is smaller than the silicone ring used in general, and the compatibility with the casing and accessories is higher. It requires more precise (micro) injection molding technology.

Automotive parts interface waterproof seal

# Material System

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## Low-alloy steels

- Fe-2Ni
- Fe-8Ni
- 2200
- 2700
- 4605
- 4140
- 100Cr6
- 8620
- 8740
- 42CrMo4
- 1010

## Stainless steel

- 17-4PH
- 304L
- 310N
- 316L
- 420
- 430
- 440
- PANACEA
- Duplex 2507

## Soft magnetic alloy

- Fe-50Ni
- Fe-3Si
- Fe-50Co
- Fe-35Co

## Low thermal expansion coefficient alloy

- Invar alloy
- Kovar alloy

## Titanium alloy

- CP-Ti
- Ti-6Al-4V
- Ti-Al intermetallic compound

## Tungsten alloy

- W-Ni-Fe
- W-Ni-Cu
- W-Cu

## Copper alloy

- Copper
- Bronze

More customizable alloys...

Function
Appearance

# Lightweight materials - Titanium Alloys

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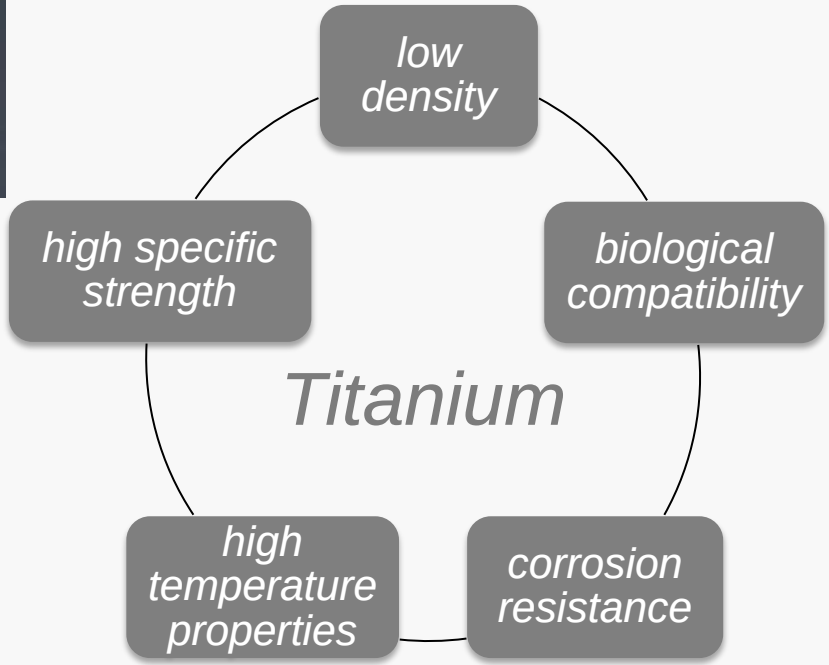
Electronic

Medical




Aerospace

Military

# Lightweight materials - Titanium Alloys

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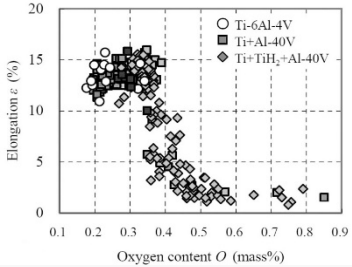
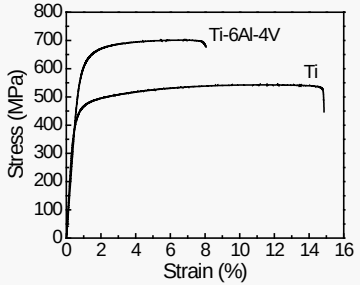
## Commercial MIM-Ti




- Only few companies have MIM-Ti capability
- Product quality is not good due to out of control the impurities

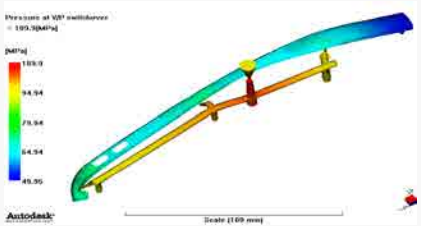
## MIM-Ti


- Near net sharp all structures
- Extremely **complex curved surface** difficult to machining
- Only **6 grams** in weight Good bio-compatibility, good corrosion resistance

### Solutions

- **Unique formula (**Add small amount of special elements)
- Special equipment (Patented equipment for mixing and injection molding)
- special process (De-binding and sintering)



# Lightweight materials - Pure titanium technical data

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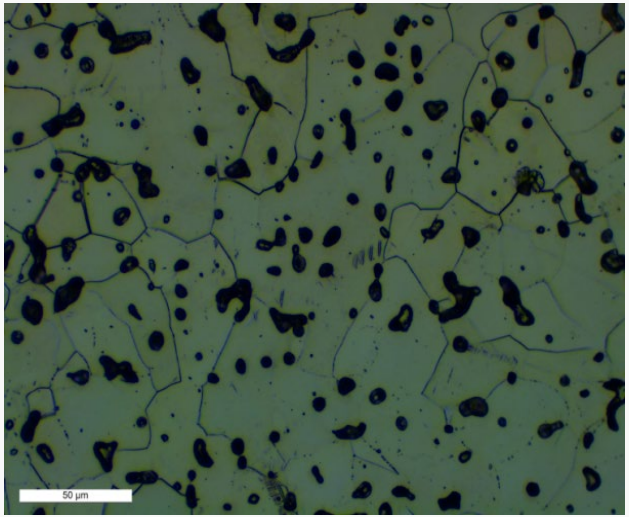
Typical composition

| O (%) | N (%) | C (%) | Ti (%) |
|---|---|---|---|
| 0.15-0.2 | < 0.02 | 0.06-0.08 | Balanced |

Characteristic Properties:

- Density: ≥4.3g/cm$^3$
- Yield Strength: ≥450MPa
- Ultimate Tensile Strength: ≥510MPa
- Elastic modulus: 100-120GPa
- Elongation: ~15%
- Hardness: ~ 200 HV1



# Lightweight materials - TC4 Products

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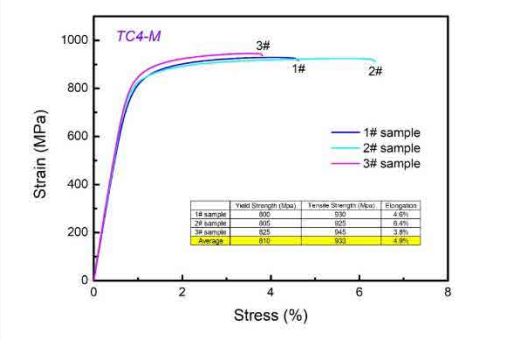
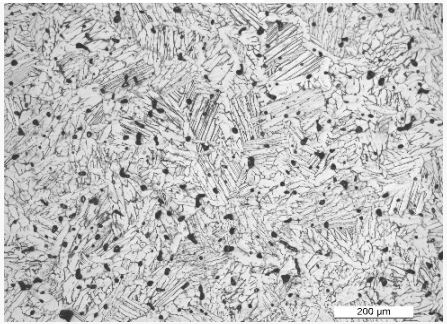



## Typical composition

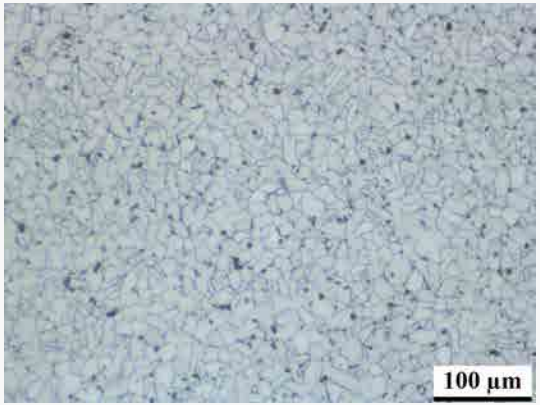
| Al (%) | V (%) | O (%) | N (%) | C(%) | Ti (%) |
|---|---|---|---|---|---|
| 5.5-6.75 | 3.5-4.5 | < 0.3 | < 0.05 | 0.06-0.08 | balanced |

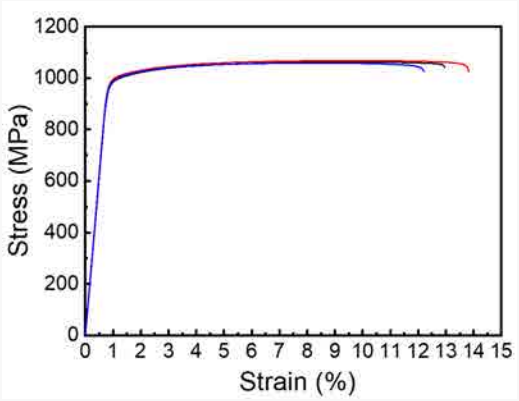
## Characteristic Properties:

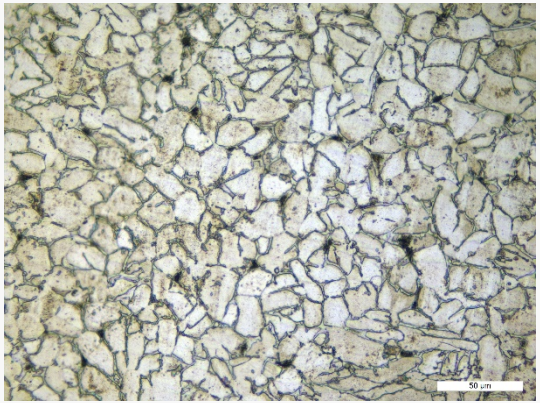
- Density: ≥4.35g/cm$^3$
- Yield Strength: ≥900MPa
- Ultimate Tensile Strength: ≥1000MPa
- Elastic modulus: 100-120GPa
- Elongation: ≥10%
- Hardness: ≥ 300 HV10

# Lightweight materials - TC4 Products





- By adjusting the microstructure of MIM-TC4 through a special process, an equiaxed crystal structure like forged titanium alloy is obtained, and the crystal grains are very small, and the mechanical properties are greatly improved
- Density greater than 99%, yield strength greater than 900MPa, tensile strength greater than 1000MPa, elongation greater than 10%
- Using lower cost powder reduces the overall cost of parts

# Lightweight materials - Comparison performance with international standards

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| | Mechanical Properties | | | |
|---|---|---|---|---|
| | Tensile Strength, min | Yield Strength (0.2 % Offset) min or range | Elongation in 4D, min, % | Reduction of Area, min % |
| ASTM B348 Grade 2 Requirements | 345 Mpa | 275 MPa | 20 | 30 |
| EP (as-sintered) | 545 Mpa | 450 MPa | 15 | -- |
| EP (MIM+HIP) | 635 Mpa | 537 MPa | 30 | -- |
| | | | | |
| ASTM B348 Grade 5 Requirements | 895 MPa | 828 MPa | 10 | 25 |
| EP (as-sintered) | 1000 Mpa | 900 MPa | 15 | -- |

- In addition to the elongation rate, pure titanium sintered parts have reached the ASTM B348 pure titanium grade 2 standard. After hot isostatic pressing, the mechanical properties have surpassed the grade 2 standard.
- The sintering properties of Ti-6Al-4V titanium alloy surpass the ASTM B348 grade 5

# Lightweight materials - Porous Ti-Al intermetallic compound

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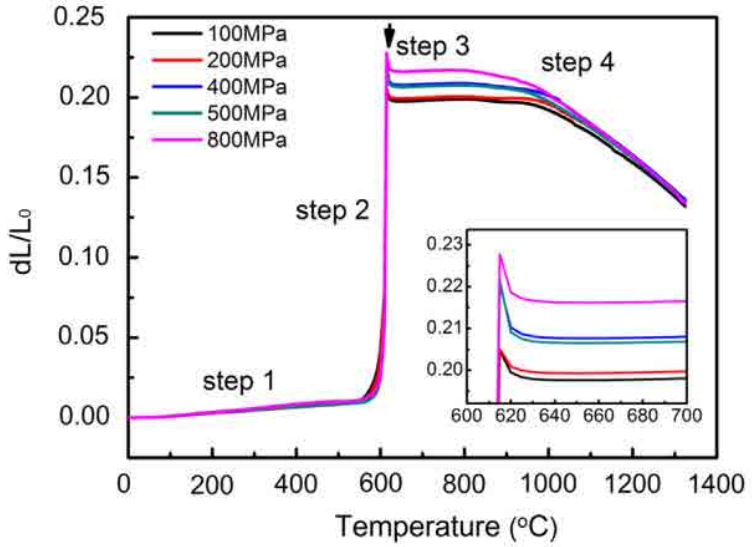


Expansion of Ti-Al during sintering

# Lightweight materials - Porous Ti-Al intermetallic compound

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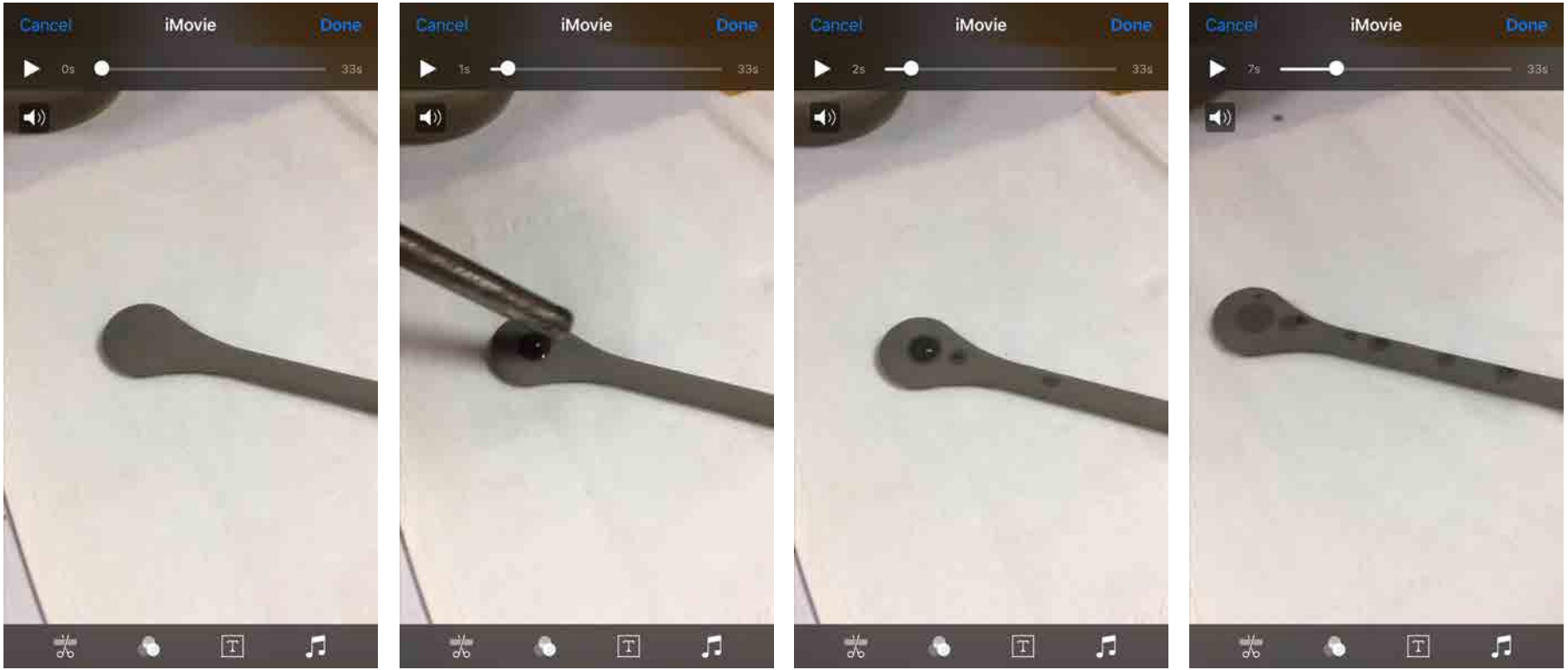


Good water or oil permeability

# Lightweight materials - Aluminum Alloys

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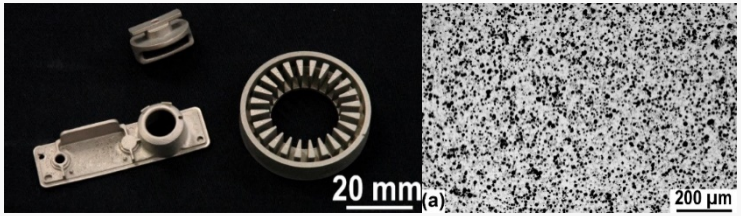
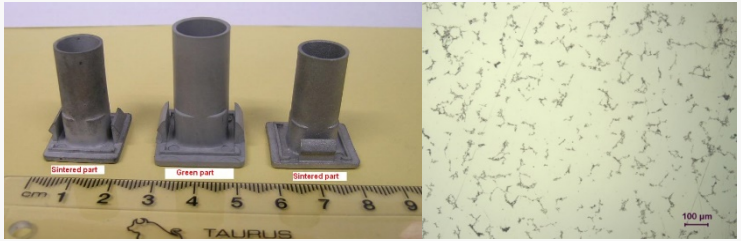
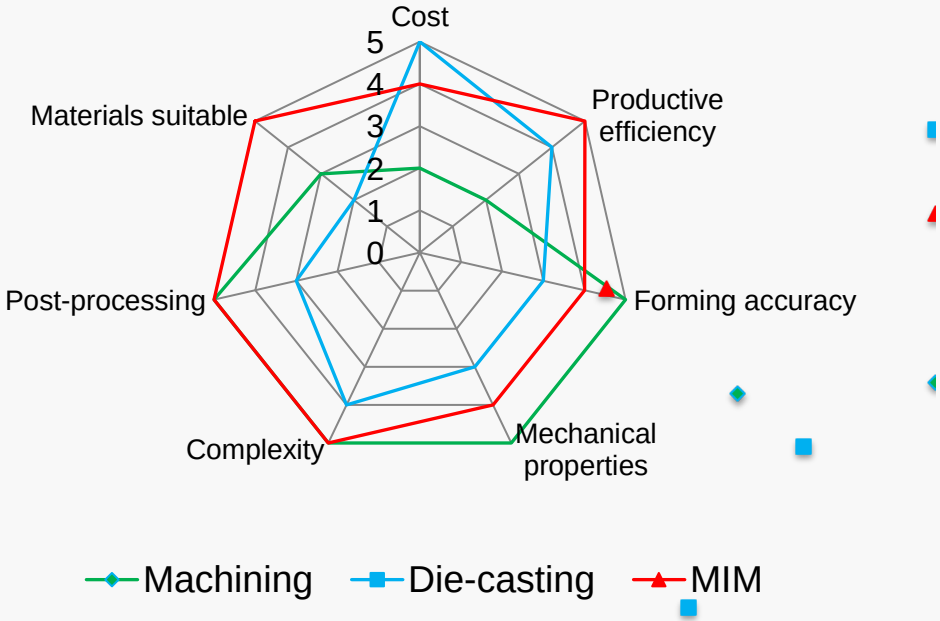
## MIM-Al (lab stage)




Porous MIM aluminum alloy

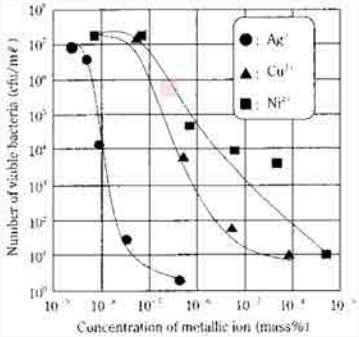


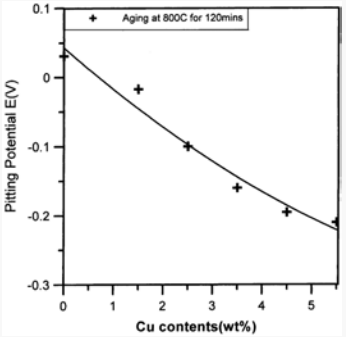

Compact MIM aluminum alloy

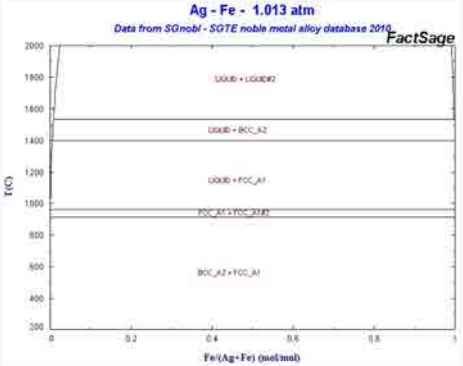


# Antibacterial stainless steel






Ag > Hg > Cu > Cd > Cr >P b > Co > Au > Zn > Fe > Mn > Mo > Sn

- Among all metal elements, silver has the strongest antibacterial ability, about 100 times that of copper
- Has a broader spectrum of antibacterial, can kill more types of pathogenic bacteria
- Adding less than one-tenth of copper, has little effect on the performance of the original grade stainless steel
- Silver and iron are typical immiscible element systems, and have almost no solubility in liquid or solid state
- The existing casting process is very prone to segregation of silver elements, and the improvement of heat treatment process is very limited
- The antibacterial performance is unstable, the energy consumption of the heat treatment process used is high and the effect is not obvious, so it is difficult to be used in industrial production

# Antibacterial stainless steel

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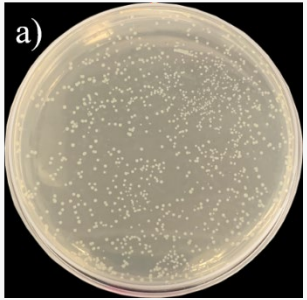
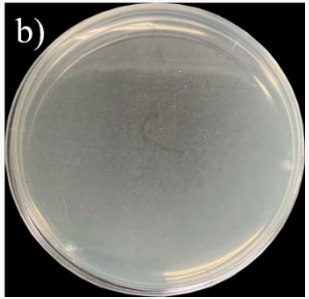
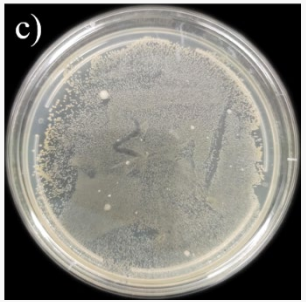



Cast silver-containing antibacterial steel




New silver-containing antibacterial steel




Conventional stainless steel


- By adding a silver-containing compound to the feedstock, the compound decomposes to form dispersed silver particles during sintering
- Excellent antibacterial performance, the broad-spectrum antibacterial reaches more than 99%
- Stable antibacterial ability, dispersed and uniform silver particles
- With permanent antibacterial ability, not afraid of scratching and cutting

# High Thermal Conductivity Material - Tungsten-Copper Alloys

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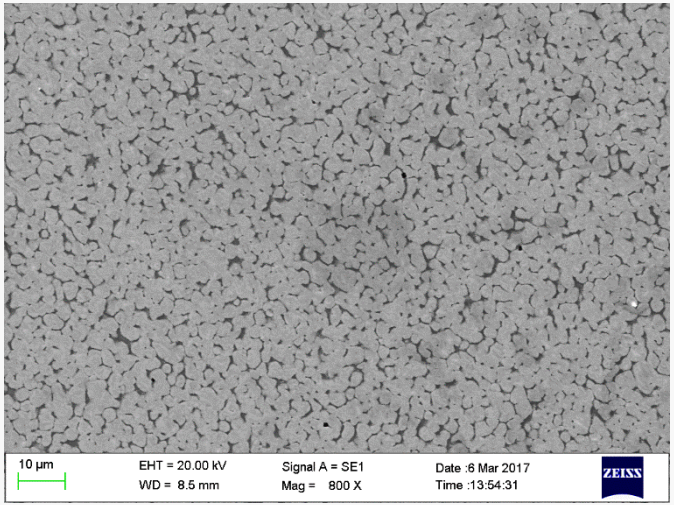
| Material | Density g/cm³ | Thermal Conductivity W/m·k |
|---|---|---|
| W80-Cu20 | 15.2 | 180 |
| W85-Cu15 | 15.9 | 170 |
| W90-Cu10 | 16.7 | 160 |




W90-Cu10, as-sintered, typical microstructure

## Application

- electric contact parts
- welding electrodes
- heat sinks
- electric discharge machine

# High Thermal Conductivity Material - Copper-Chromium alloy

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The copper-chromium alloy is an alloy formed by adding Cr and other trace alloying elements to Cu as a matrix. The alloy has high mechanical strength and hardness at room temperature and below 400 ° C, has good electrical and thermal conductivity, excellent wear resistance and wear reduction performance, and has resistance to high temperature oxidation, wear resistance and good processing performance, widely used in parts that require high strength, high hardness, high electrical conductivity and thermal conductivity at high temperatures.

## Characteristic Properties:

- Density: ≥8.7g/cm$^3$
- Yield Strength: 280MPa
- Hardness: 70~100 HV
- Thermal conductivity: 250 W/(m·K)

# High Thermal Conductivity Material - Copper

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- High thermal conductivity
- Good plasticity
- Good ductility
- High conductivity

Characteristic Properties:

- Density: ≥8.5g/cm$^3$
- Yield Strength: 69MPa
- Ultimate Tensile Strength: 207 MPa
- Elongation: ~30%
- Thermal conductivity: 330 W/(m·K)

# High Thermal Conductivity Material - Aluminium Nitride，AlN

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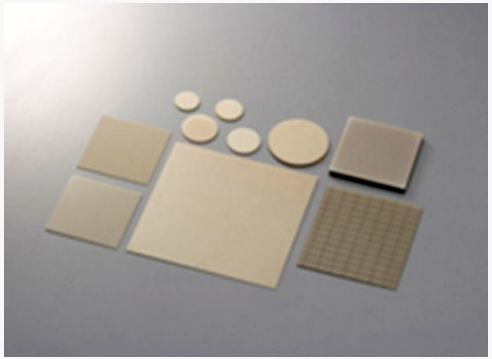
- High thermal conductivity (about 320W / m · K), close to BeO and SiC, and more than 5 times that of $Al_2O_3$;
- Coefficient of thermal expansion ($4.5\times10^{-6}$℃) matches Si ($3.5\text{-}4\times10^{-6}$℃) and GaAs ($6\times10^{-6}$℃);
- Excellent electrical properties (dielectric constant, dielectric loss, bulk resistivity, dielectric strength);
- Good mechanical properties, flexural strength is higher than $Al_2O_3$ and BeO ceramics, and can be sintered at atmospheric pressure;
- Good optical transmission characteristics;
- Non-toxic.



# High Thermal Conductivity Material - High silicon aluminum alloy

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| Content | Coefficient of thermal expansion $\times 10^{-6}$ /K | Thermal conductivity $W \cdot m^{-1} \cdot K^{-1}$ | Ultimate Tensile Strength MPa | Yield Strength MPa |
|---|---|---|---|---|
| Al-Si27 | 17 | 160 | 160 | 110 |
| Al-Si42 | 13 | 150 | 210 | 155 |
| Al-Si50 | 11 | 140 | 150 | 125 |
| Al-Si60 | 9 | 129 | 120 | - |
| Al-Si70 | 7 | 120 | 110 | - |

- Low coefficient of thermal expansion
- Good thermal conductivity
- Low density
- Easy to process

# Soft magnetic alloy - Fe-Co alloy

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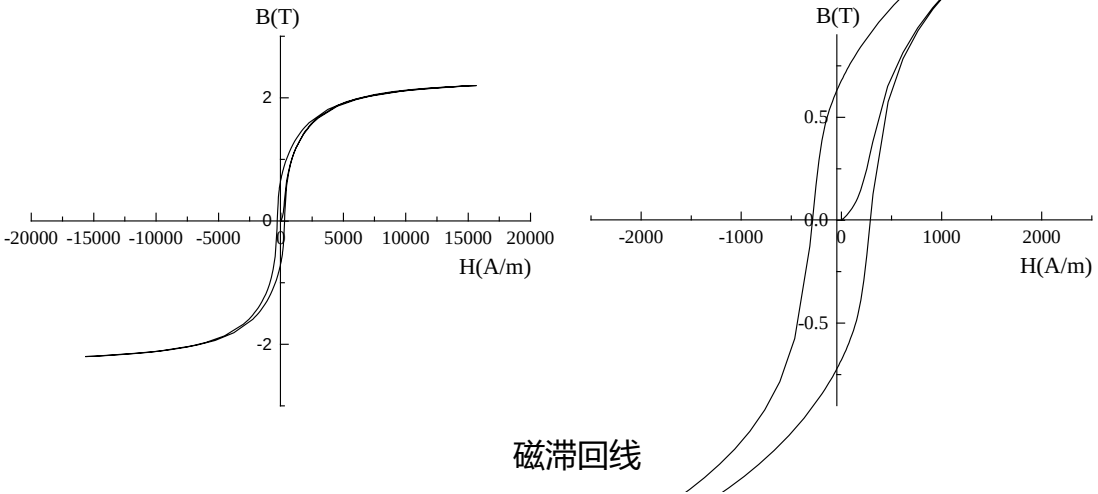



磁滞回线

## Magnetic properties

| | *Bs (T)* | *Br (T)* | *Hc (A/M)* | $\mu_{max}$ |
|---|---|---|---|---|
| *Fe-35Co* | *2.2* | *0.65* | *248* | *1146* |
| *Fe-50Co* | *2.3* | *1.60* | *127* | *2000* |

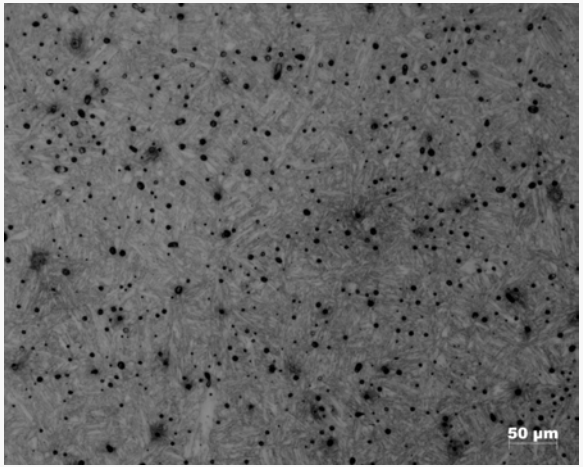
## Application

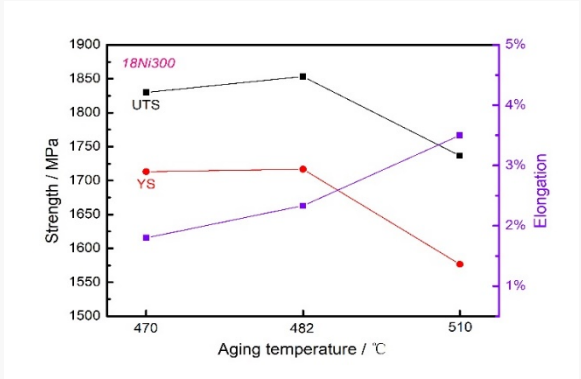
- Motor parts
- Bluetooth earphone
- Automated production line, etc.

# High strength steel

## Features of Maraging Steel

- Ultra-high strength at room temperature (yield strength greater than 1300MPa)
- Simple heat treatment to ensure minimal deformation
- Excellent fatigue toughness compared to quenched steel at the same strength level
- Good welding performance
- Easy machining, low machining distortion



# Stainless steel Products in EP - 17-4PH

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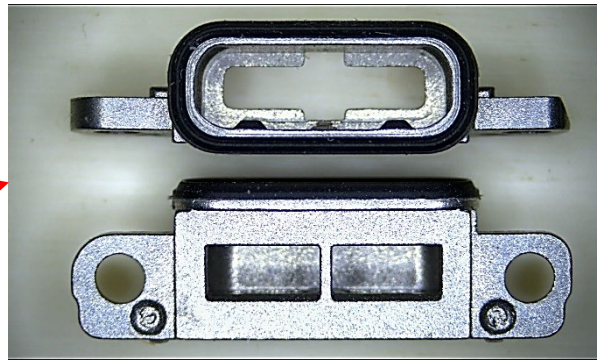
Premium Quality, Competitive Cost, Professional Service

*Type-C socket: 17-4PH*



# Stainless steel Products in EP - non-magnetic 17-4

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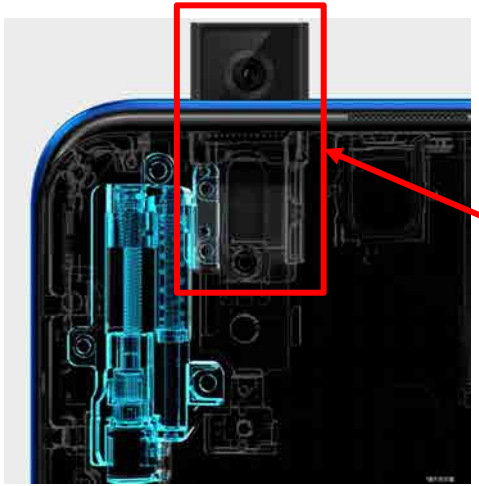
Huawei HONOR



- Precipitation hardening martensite (with magnetic) → special sintering process → austenite (non-magnetic)
- Higher hardness and strength than general sintered austenitic stainless steel
- Improved salt spray resistance

# Stainless steel Products in EP – for parts with appearance requirements

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Xbox Elite Wireless Controller

- Uses 316L and 17-4PH stainless steel
- 316L stainless steel is mainly used for parts that need mirror polishing
- 17-4PH is used for parts requiring magnetic attraction
- The requirements for injection molding and sintering process are extremely high, the surface of the green part must not have any black lines, and the friction marks between the sintering jig and the product should also be considered to avoid

# Stainless steel Products in EP - Nickel-free stainless

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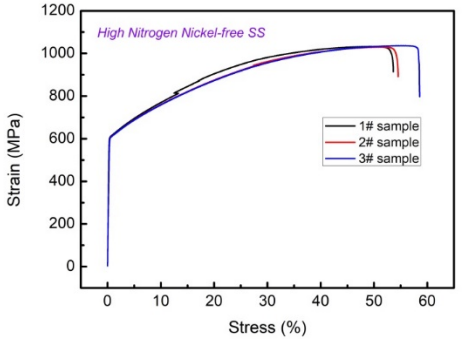
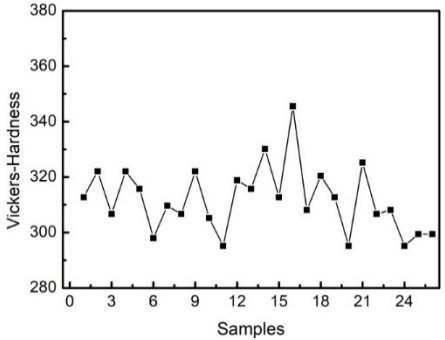
*P20*

*P30 Pro*

*Camera support: panacea*




Mechanical properties




Micro hardness

# Stainless steel Products in EP - Nickel-free stainless

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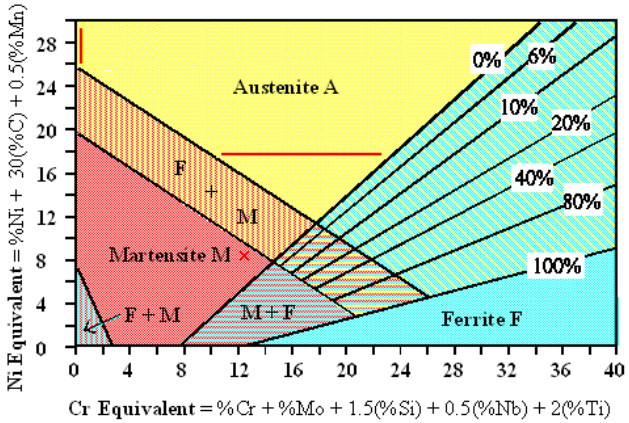


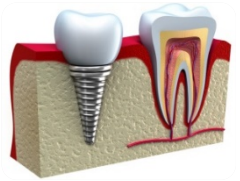

**316L Advantage**

- Corrosion resistance
- Good ductility
- Polishing, high quality surface

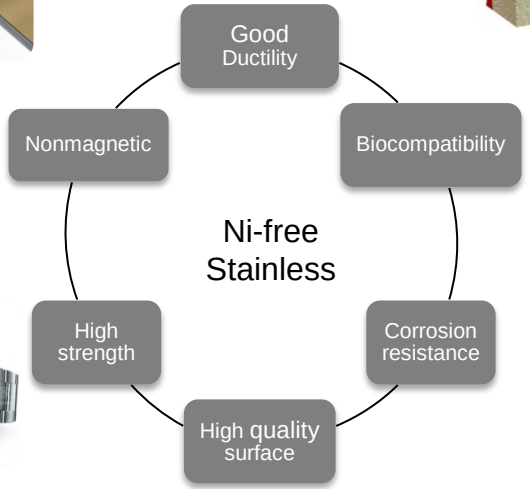
**316L Disadvantage**

- Low strength, low hardness
- Contains large amount of nickel, leading to allergic reactions of human body

**Electronics**



**Bio-implants**




**Luxury**

**Wearable device**

# Stainless steel Products in EP - Nickel-free stainless

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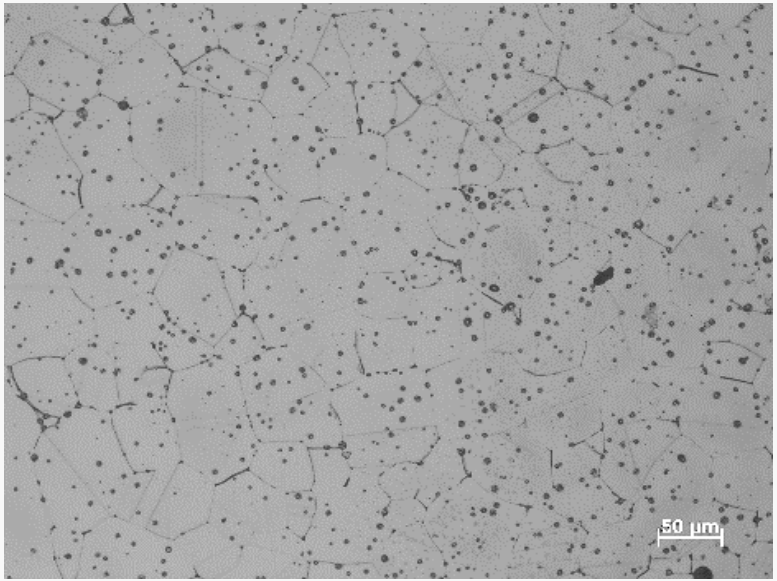
Typical composition

| C % | Cr % | N % | Ni % | Mn % | Mo % | Si % | Fe % |
|---|---|---|---|---|---|---|---|
| ≤0.2 | 16.5-17.5 | ≥0.6 | ≤0.1 | 10-12 | 3.0-3.5 | ≤1 | balanced |

Characteristic Properties

| | |
|---|---|
| **Density** | ≥7.6 g/cm$^3$ |
| **Yield Strength** | ≥560 MPa |
| **Ultimate Tensile Strength** | ≥950 MPa |
| **Elongation** | ≥50% |
| **Hardness** | 280-350 HV |




Metallography

# Stainless steel Products in EP – 316L for Cosmetic Parts

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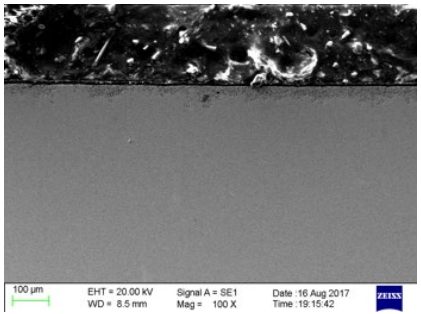
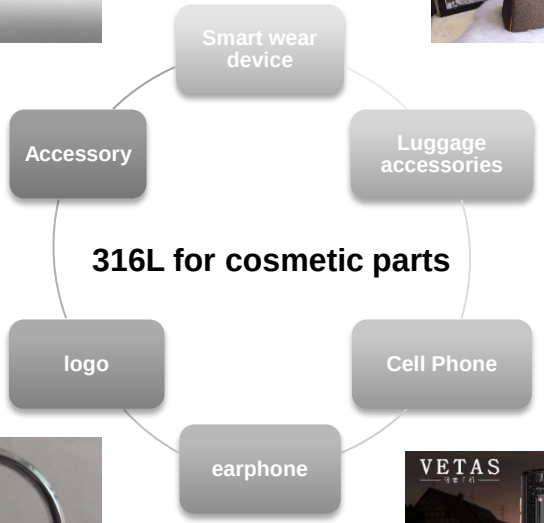
## Key point

- Finer powder
- Optimized binder
- Sintering atmosphere
- Impurity control




# Super-Duplex stainless steel (2507)

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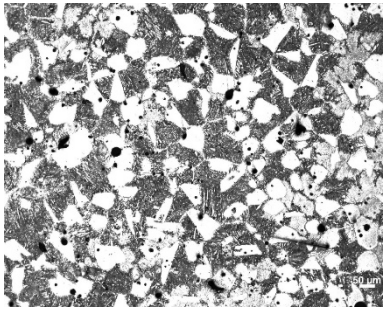
## Main characteristics

- Very high resistance to pitting and crevice corrosion
- Excellent resistance to stress corrosion cracking (SCC) in chloride bearing environments
- High resistance to general corrosion in acids
- Excellent resistance to erosion corrosion
- Excellent resistance to corrosion fatigue
- Very high mechanical strength
- Good weldability



*Austenite + Ferrite*

| | 316L | 304 | 17-4PH | 2507 |
|---|---|---|---|---|
| **Yield Strength $R_{p0.2}$ / MPa** | 180 | 170 | 750 | 530 |
| **Ultimate Tensile Strength UTS / MPa** | 540 | 630 | 1060 | 730-930 |
| **Elongation / %** | 60 | 60 | 3 | 25 |
| **Hardness / HV** | 120 | 130 | 320 | 300 |
| **PREN*** | 23-29 | 17-21 | below 300 series | > 40 |
| **Microstructure** | Austenite | Austenite | Martensite | 50:50 Austenite / Ferrite |
| **Magnetism** | not magnetic | not magnetic | ferro magnetic | ferro magnetic |

PREN* = pitting corrosion resistance number

# Foldable phones hinge materials

## Performance requirements

- High yield strength: greater than 600MPa
- Good wear resistance (high hardness): greater than HV300 or HRC35
- Light weight: achieved by material density or structural design

## Size requirements

- Strict tolerance of rotating surface: hole position, arc surface
- Some parts are long and thin, with high flatness and straightness.
- 3D shape is complex, suitable for PIM process
- Tolerance challenges PIM process limits

Candidate material

17-4PH

Fe-8Ni

Ti-6Al-4V

Amorphous alloy

Zirconia ceramic

# Performance comparison

XY-GLOBAL
Premium Quality, Competitive Cost, Professional Service

| | Density | Yield Strength | tensile strength | Elongation | Hardness | advantage | Disadvantage |
|---|---|---|---|---|---|---|---|
| **17-4PH** | 7.68 | 650 (as-sintered)<br>1000 (HT) | 1000 (as-sintered)<br>1100 (HT) | >6% (as-sintered)<br>>3% (HT) | 280-320 HV (as-sintered)<br>350-450 HV (HT) | Good corrosion resistance, bright appearance and low price | Heat treatment is easy to deform, too tight tolerance cannot be guaranteed |
| **Fe-8Ni** | 7.60 | 400 (as-sintered)<br>1100 (HT) | 700 (as-sintered)<br>1250 (HT) | 3% (as-sintered)<br><1% (HT) | 150-280 HV (as-sintered)<br>400-550 HV (HT) | Cheap price and simple heat treatment process | Poor corrosion resistance and high brittleness |
| **Ti-6Al-4V** | 4.25 | 820 | 950 | >2% | 300 HV | Good corrosion resistance and light weight | Expensive, difficult to process (Tapping) |
| **Amorphous alloy** | 6.30 | —— | Bending strength 2200 | <1% | 500 HV | High flexural strength, not easy to break, good wear resistance | Poor elongation, easy to break |
| **Zirconia ceramic** | 6.10 | —— | Bending strength 700 | <1% | 1300 HV | High hardness and good wear resistance | High brittleness |

# Ceramic

XY-GLOBAL
Premium Quality, Competitive Cost, Professional Service

Chemically stable | Hard | Nonmagnetic

Oxidation resistant | Wear-resistant | Thermal insulators

Electrical insulators | Refractory

| Properties | Unit | 99%$Al_2O_3$ | 3Y-TZP | $Si_3N_4$ | SiC | ZTA | Super-$ZrO_2$ |
|---|---|---|---|---|---|---|---|
| Density | g/cm³ | ＞3.5 | ＞5.8 | ＞3.0 | ＞3.0 | ＞4.7 | ＞6.09 |
| Hardness | HRA | 91 | 88~99 | 92~93 | 92~94 | 91 | 93 |
| Bend strength | MPa | 350 | 700 | 700 | 500 | 550 | >1600 |
| Compressive strength | MPa | 3000 | 2100 | 3500 | 2800~3000 | 2100 | 3000 |
| Fracture toughness | $MPa.M^{-3/2}$ | 2~4 | 10 | 7 | 5 | 6.7 | ≥18 |
| CTE | $\times 10^{-6}$/℃ | 6.5~8.4 | 10.2 | 3.2~4 | 4.3 | 7 | 10.2 |
| Resistivity | Ω.Cm | $10^{14}$~$10^{16}$ | >$10^{10}$ | >$10^{14}$ | <200 | >$10^{14}$ | $10^{14}$ |
| Elastic modulus | GPa | 260 | 300 | 410 | - | 300 | 500 |

# Capabilities

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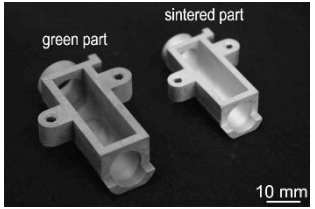
## Hardware and Software

- Works closely with the Powder Metallurgy Laboratory of SUSTech & USTB to develop new materials and processes for powder injection molding, liquid metal, 3D printing, etc.
- Currently has 35 production lines and some special materials processing equipment. Plans to increase to 46 production lines by the end of 2020
- Construction of a high-level powder metallurgy laboratory, planning to apply for the National Engineering Center around 2021.

## Core-competitiveness




- Focus on MIM new materials, master the core technology on **Ti, Cu, Al, W, special stainless steels (Panacea, Duplex stainless steel), iron-cobalt alloy, Fe3Si & Ceramic ……**Etc.
- Development of liquid metal and titanium alloy 3D printing technology
- Research the MIM technology with low-cost Ti powder
  **(Special formula, Special process)**

# Main Lab devices

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SEM

STA

DIL

Torque Rheometer


Capillary Rheometer

Metalloscope


Carbon and Sulfur Determinator


Oxygen and Nitrogen Determinator

Injection Machine

HAAKE MiniJet

Universal Tensile Test Machine

MFR

# Main Producing Devices

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## In Use


Mixer 10X


Injection Machine 40X


De-binding 10X


Sintering 16X


Restriking 30X


Tumbling 10X

## In plan

# Mold center

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| Device name | Brand | Coming soon | In plan | Initial monthly capacity |
|---|---|---|---|---|
| CNC | MIKRON、Quick Jet | 2 | 3 | Precision forming mold: 10sets<br>Shaping mold: 30sets |
| Wire cutting | +GF+、SODICK | 2 | 4 | |
| EDM | MAKINO、SODICK | 2 | 4 | |
| Grinder | SEEDTEC、Joen Lih | 3 | 5 | |
| Milling | GENTIGER | 3 | 5 | |




CNC (fanuc) ×15

CNC (taikan) ×3

Drilling machine×1


Wire cutting machine×5 (Sodick)

lathe×3

Polishing and drawing machine

Wet polishing machine

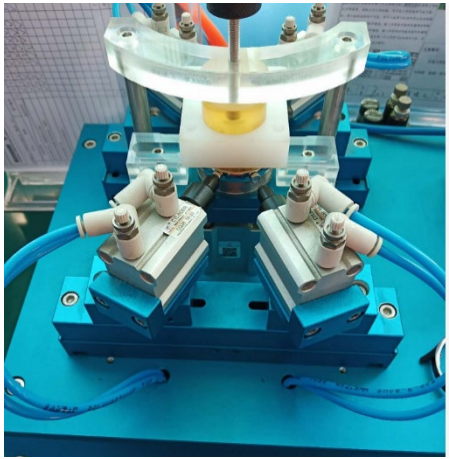
Wet polishing machine

Laser carving

Pad printing

Welding

Air tightness test



Life span test

# Equipment for Quality control

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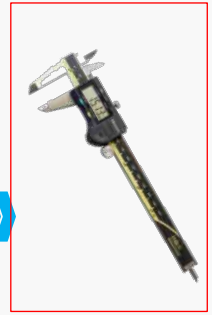
**2.5** Dimension

**Electronic Density Balance**

**Salt Spray Test**

**Height gauge**



**Caliper**

**Electronic Balance**

| Feedstock Room | | | Product Department | | | Quality Department | | |
|---|---|---|---|---|---|---|---|---|
| 1 | MFR | 1 X | 1 | Projector | 1X | 1 | CCD | 13X |
| 2 | Electronic Balance | 2 X | 5 | Electronic Density Balance | 1X | 2 | Jin-dong wear-resistant tester | 1X |
| 3 | powder solid density tester | 1 X | 1 | Height gauge | 12X | 3 | Tool microscope | 3X |
| 4 | Laser granularity meter | 1 X | 4 | Caliper | 26X | 4 | Vickers hardness | 1X |
| 5 | Loose density meter | 1 X | 5 | | | 5 | Rockwell hardness | 1X |

# Equipment for Quality control

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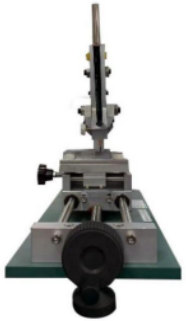
Friction Testing Machine

Friction Testing Machine



pencil hardness tester

Water drop angle test

Tensile test

# Equipment for Quality control

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Visual inspection equipment

**Detection Indicator:**

Surface defects, dimensional measurement, thread inspection, feature inspection, assembly accuracy, presence or absence of gaskets and fasteners, lack of material, internal hole blockage, cracking, burrs, solder joints, imprints, etc.

**Detection speed:**

≤ 0.03~0.05 seconds

**Detection accuracy:**

±0.01mm

# New Product Introduction Process

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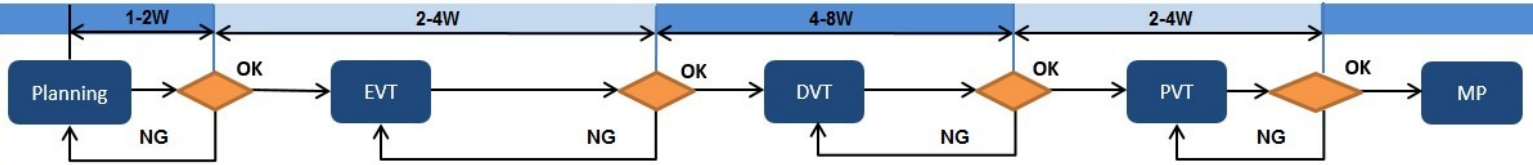
**General Flow**




| | | | | | |
|---|---|---|---|---|---|
| **Goal** | Project Approval | Confirm product specifications | Confirm product by customer | Capacity evaluation pass | Yield rate reach the standard |
| **Sample Build** | NA | EVT1, EVT2, EVTn | DVT1, DVT2, DVTn | PVT1, PVT2, PVTn | |
| **Key Activity** | - Quotations<br>- DFM<br>- Cost Evaluation<br>- Project Approval | - Set up the project team, kick-off meeting<br>- Project Plan R0.1<br>- Internal product specifications<br>- Send DFM to customer<br>- Process Design<br>- Process flow chart<br>- PFMEA<br>- Control Plan<br>- EVT build<br>- Submit EVT sample to custom<br>- Publish product specifications R1.0<br>- Tooling manufacture | - Project Plan R1.0<br>- Process Design<br>- Process flow chart<br>- PFMEA<br>- Control Plan<br>- SOP/SIP<br>- DVT1 Build<br>- QA test<br>- DVT1 Build Report<br>- Sample acknowledgement book<br>- Ramp-up Plan<br>- Customer's Order Confirmation | - Prepare documents for MP<br>- Process flow chart<br>- PFMEA<br>- Control Plan<br>- SOP/SIP<br>- PVT1 Build<br>- PVT1 Build Report | - Cost Evaluation again<br>- Lesson Learnt<br>- Project complete<br>- Project transfer |

# Quality Assurance System

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## Quality Policy

- Quality supreme
- Customer first
- Continuous improvement