BE-CU Prototype:Can You 3D Printing Metals For Aluminum,Titanium and more?

Yes, it is possible to 3D print objects in metal, and there are several manufacturing processes that fall under the umbrella of metal additive manufacturing

Matto, Ishikawa Sep 11, 2024 (Issuewire.com) - The metal 3D printing process involves directly sintering or melting metal powders, or combining them with a second material for delivery through a nozzle, and it can be used for rapid prototyping and finished parts in aerospace, mechanical engineering, tooling, and more.

Which metals cannot be 3D printed?

In theory, any metal can be used for 3D printing(as 3d printing titanium grade 5), as long as it is available in suitable powder form. However, materials that burn rather than melt at high temperatures cannot be safely processed by sintering or melting, but can be used for 3D printing when extruded through a nozzle. Wood, cloth and paper cannot be 3D printed using these processes. Solid objects can also be made from metal powders using sintering (shaping in a mold at high temperature and extremely high pressure), and for metals with very high melting points, sintering is the only reliable way to make objects from these materials.

Which metals can be used for 3D printing?

A variety of different metals can be used in powder form to make parts by 3D printing. Titanium, steel, stainless steel, aluminum, copper, cobalt chrome, titanium, tungsten, and nickel-based alloys can all be used in powder form for 3D printing, as can precious metals such as gold, platinum, palladium, and silver. These different metals have different properties that make them suitable for a variety of applications. For example, stainless steel has excellent corrosion resistance and is ideal for printing pipes, valves, and steam turbine parts.

What 3D printing processes can be used to 3D print metal?

As mentioned above, there are various 3D printing metal technologies, powder fusion technology, including direct metal laser sintering (DMLS), SLM (selective laser melting) and EBM (electron beam melting), is the most widely used technology in metal additive manufacturing:

Direct Metal Laser Sintering (DMLS)

This common method, which uses lasers to sinter metal powder layer by layer to form objects without actually melting the metal, is used for prototyping and manufacturing finished parts, including medical devices and instruments.

Selective Laser Melting (SLM)

The process involves using a laser to melt the desired material within layers of powder in an inert gas environment, layer by layer to build objects with parameters similar to those produced by casting. Selective laser melting is commonly used to make aluminum and titanium parts, including those for the medical, automotive and aerospace industries.

The process is similar to selective laser melting, except electron beams are used instead of lasers to melt the material. Electron beam melting is considered faster and more precise than selective laser melting and is commonly used to make cobalt and titanium products. Electron beam melting is widely used by the aerospace industry for items including engine components.

Other crafts:

There are other techniques that can or have been used to 3D print metals, although these are not as widely used as Direct Metal Laser Sintering, Selective Laser Melting or Electron Beam Melting:

Laser Metal Deposition (LMD)

Laser metal deposition is used in the aerospace, automotive and medical industries to create objects by depositing heated metal layer-by-layer onto a metal substrate, allowing parts to be built using different materials and much faster than other methods.

Selective Laser Sintering (SLS)

Similar to laser metal deposition, this process also uses a laser to sinter powdered materials. It has been used to make items in a variety of materials, including stainless steel printing, however, today it is mostly used in sintered plastics such as polyamide and nylon.

binder jetting

The process uses a special liquid to bind powdered materials and is less expensive than direct metal laser sintering, selective laser melting or electron beam melting. The accuracy and strength provided by this process is not perfect, and post-processing is usually required. Hot isostatic pressing can be used to increase the strength and robustness of the finished product, but this adds cost, and binder jetting is often used to manufacture or cnc large parts and complex prototypes.

metal injection molding

This combination of injection molding and 3D printing is widely used to make small components in industries such as medical and defense, and the process works by mixing metal powder with thermoplastic and wax binders. This mixture is heated until the binder melts and coats the powder, which is then turned into pellets. These particles are heated and injected into a cavity to form an object, usually by solvent extraction, before the binder material is removed. The part is then sintered, evaporating any remaining binder and compressing the object into a dense solid, which can then be completed as desired.

in conclusion

Metal 3D printing, or additive manufacturing, allows the creation of parts that are nearly as strong as ordinary metal objects. While it can be expensive and not very suitable to replace traditional manufacturing for high-volume production of standard items, it is ideal for making smaller, more complex items. Metal 3D printing also helps to lighten parts used in industries such as aerospace and automotive.

Aluminum alloy 3D printing parameters:

Layer thickness: 0.02-0.05mm

Dimensional accuracy: ±0.1mm

Material: Aluminum alloy (AlSi10Mg)

Surface roughness: 6-10 microns

Performance parameters of 3D printed aluminum alloy:

Yield strength (0.2% strain): 230MP

Tensile strength: 350MP

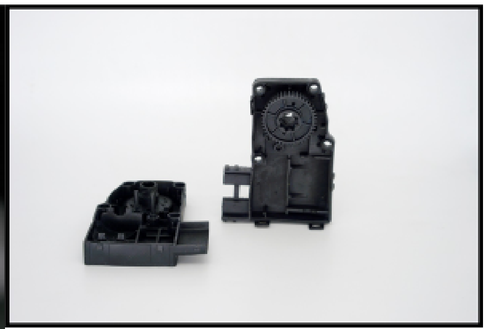
Elongation at break: 12%

Hardness: 119HBW

Fatigue Strength: 97MP

Density: 2.7g/cm3

BE-CU Prototype was established on May 20, 2020. It focuses on 3D printing custom processing services. It has more than 10 years of experience in 3D printing processing of precision parts, focusing on supporting services such as small tolerances, complex structural prototypes, and small batch production of high-precision metal parts. Products are widely used in machinery, medical, communications, electronics, electrical appliances, automobiles and other fields.



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