AP&C
a GE Additive company

Get the facts on ...

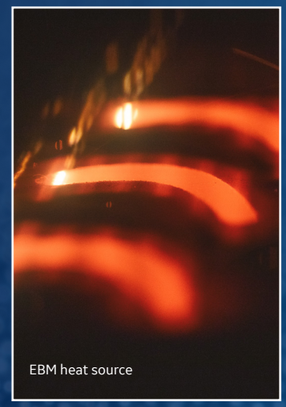
Titanium Aluminide

Titanium Aluminide (TiAl) is one of the most challenging metal alloy powders within additive manufacturing, yet increasingly customers are realizing its potential for high-end applications where performance is key. The combination of titanium and aluminum in precise ratios enables TiAl, an intermetallic compound, to have some unique properties that can be customized to meet demanding application requirements. TiAl powders are created at AP&C using its proprietary plasma atomization process. The plasma atomization process has a high degree of controllability and uses plasma torches to transform the raw material or liquid metal stream into a powder. This process creates TiAl powders with highly spherical particles thanks to a long residence time that allows the particles to settle into their optimal size and shape. TiAl powders created in this manner also possess a low porosity, as well as an excellent flowability and packing density.

DID YOU KNOW?

TiAl is typically a hard and brittle material, which makes it hard to manufacture and process using conventional manufacturing methods because cracks can easily form. This means that complex heat processes must be used to make the TiAl usable—and this has been responsible for the high cost of TiAl over the years.

While TiAl is still more expensive than other alloys, many of these issues can be negated using electron beam melting (EBM) as it enables TiAl powders to be easily manufactured into complex parts and shapes (that would otherwise not be possible) without the need for secondary heat processes.


EBM heat source

Aerospace

Today, TiAl is used to manufacture low temperature turbine blades within jet engines. Its low weight and high temperature resistance is key for jet engine turbine.

Automotive

The high temperature resistance of TiAl makes it an ideal material for supercars, where the performance and light-weighting outweigh the economic factors. One key example is within turbochargers, as TiAl parts not only offer an enhanced performance, they also increase the longevity of the turbocharger.

Lifestyle

The hardness, bright color and corrosion resistance of TiAl makes it an ideal material for high-end watches.

A UNIQUE MATERIAL

TiAl is a unique material with a number of key properties that lie between titanium and high temperature nickel superalloys, making it an attractive material for different applications. Of all the titanium alloys on the market, TiAl has the highest oxidation resistance at high temperatures and can compete with many of the nickel superalloys available.

TiAl has the advantage over many of these nickel superalloys in that it has half the density, so you can create a much lighter structure for the same volume.

TiAl also has a high mechanical resistance and tensile strength at high temperatures and an inherent hardness. This specific combination of physical and resistance properties makes TiAl a unique material compared to other alloys on the market.

Highest

Oxidation

resistance at high temps

Half the

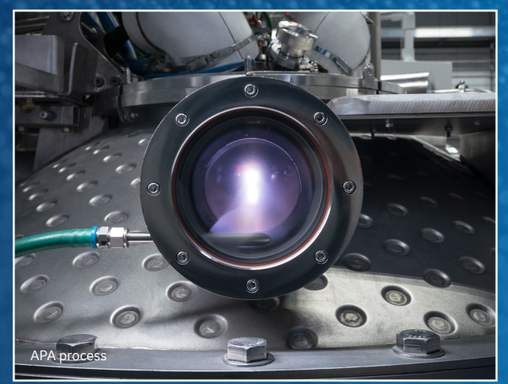
Density

of nickel superalloys

CUSTOMIZATION

If you need a customized product that is tailored to the exact specifications of your application, the plasma atomization process can fine tune the chemical composition of the powder to meet your performance requirements.

One of the added benefits of this process is that the process used to customize your powder is the same one that performs the in-situ alloying. This not only enables you to have a greater flexibility when choosing a powder, it enables us to get the powder to you in a quick time frame.


APA process