# REFRACTORY MATERIALS



# Grow your business with us

TUNGSTEN, TUNGSTEN ALLOYS, TUNGSTEN-COPPER, RHENIUM, MOLYBDENUM, MOLYBDENUM-COPPER, NIOBIUM-BASED ALLOYS, TITANIUM, TITANIUM ALLOYS, TITANIUM ALUMINIDES, TANTALUM AND NIOBIUM.

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# REFRACTORY METALS HEAVY ALLOYS & HARD METALS

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#### MATERIALS DESIGNED FOR DEMANDING JOBS

Refractory materials and hard alloys possess unique combinations of strength, hardness, ductility, toughness, density, and temperature resistance. The combination of these unique qualities make these materials perfect for situations where heat and extreme wear are present.

## Refractory metals, heavy alloys and hard metals are materials that boast high resistance to heat and wear.

Industries like Aerospace benefit from these materials, however, they are also widely used in areas like ordnance and electrical components and medical implants.

Due in part to their resistance to wear these materials are quite dense and make them difficult if not impossible to machine. After work on a part made from a refractory material needs to be ground down. This means that getting as close to near net shape and reduced after work are critical. As a result, most refractory materials heavy alloys and hard metals find great use in MIM.

As we discussed in another article, MIM allows for reduced material scrap and other cost benefits that find a good paring with refractory materials.

#### **REFRACTORY MATERIALS**

There are a number of refractory materials including: tungsten, tungsten alloys, tungsten-copper, rhenium, molybdenum, molybdenum-copper, niobium-based alloys, titanium, titanium alloys, titanium aluminides, Tantalum and Niobium.

#### **TUNGSTEN CARBIDE**

One of the most commonly used refractory materials is Tungsten. Possessing the highest melting temperature 3410 degrees Celsius, tungsten also has strong thermal and electrical conductivity, high strength and density. Tungsten also maintains size at high temperatures.

One of Tungsten's common forms in the industry is as Tungsten Carbide (WC), and is a combination of Tungsten and Carbon. WC can also be cemented with other metals to form cemented carbides. These materials have a very high hardness and make them perfect for tools and bits.





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#### **MOLYBDENUM PROPERTIES**

Molybdenum offers many of the same qualities as Tungsten, however, it's lower density can form advantages where lighter weight parts are required. Molybdenum has found many uses in the electrical industry, in heat sinks, and specialty parts.



#### **NIOBIUM ADVANTAGES**

Niobium is chemically very similar to Tantalum. For some time, there was confusion over the difference between Niobium and Tantalum. It has a lower melting temperature and the lowest density of all the refractory metals. Thus it is a leading candidate for applications where the strength to weight ratio is a critical requirement, including some specialty springs and fasteners.



# TANTALUM FOR SURGICAL TO ELECTROLYTIC CAPACITORS

Tantalum is our only refractory material to date to hold approval for long-term surgical implants. This is owing to the biocompatibility of Tantalum. However, Tantalum is also easier to machine and form which allows for the creation of a larger number of parts to be made from Tantalum. This means that the Medical industry has found a number of uses for Tantalum. Some of those applications include wire, foils, sheets, clips, staples, and meshes. Though it is used in its oxide form as an insulator in electrolytic capacitors. Refractory materials offer users the ability to create parts deigned to endure and reliably operate in difficult high stress conditions. These materials provide opportunities to improve part life in industry and give back mobility to people. CNPC POWDER offers a variety of refractory materials that can help you meet your business goals. Please take a look at our catalog and start a conversation today.

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