

#### Tungsten rod

Tungsten's unique properties as a high performance material, including a melting point of 3410° C, low vapor pressure at elevated temperatures and low coefficient of thermal expansion, make tungsten rod of value in a variety of high temperature products and processes. Among them are glass-to-metal seal parts and support parts for lighting and electronics, silicon rectifier stud mounts and high temperature furnace components.

#### Tungsten bar

Tungsten bars mainly used to found ingredient of material, cutter and heads, tungsten wire for lights instruments, electric contact points and conductor of heat, crankshaft and cylinder barrel of advanced automobile, ingredient of kinds of heat-resistant steel. Also used for making special steels, to make guns, artillery rockets, satellite airplane and ship. It has a luster rather like that of silver in uniform color. Though the whole bar may slightly curve, the maximum height of the bend should not be more than 7mm.

#### Tungsten nozzle

Tungsten nozzle can be manufactured from the material of pure tungsten, tungsten alloy and tungsten carbide. They have different prosperities, such different density, the density of pure tungsten nozzle is about 19.2~19.3g/cm<sup>3</sup>, the density of tungsten alloy nozzle is about 15-18.5g/cm<sup>3</sup> and the density of tungsten carbide nozzle is about 14.4-1g/cm<sup>3</sup>.

#### Tungsten pin

Tungsten pin is pin made of the material—tungsten. Since it is made of tungsten, tungsten pin owns the properties of high melting point, high corrosion resistance, tensile strength and low coefficient of thermal expansion. When added steel or other element, its hardness would be improved.

#### Pure Tungsten Electrode

Pure tungsten electrodes are the ones without any addition of oxide. This allows the tip to form a clean, balled end which provides good arc stability on AC. The power of electronic transgression is as high as 4.5ev. Requiring a high voltage for arc derivation, it has a low current capacity and is easily burnt. It's good for application under the condition of AC and in the situation of low welding requirements.

#### Thoriated Tungsten Electrode

2% Thoriated Tungsten contains a nominal 2 wt-% or thorium oxide (ThO<sub>2</sub>) that is evenly dispersed throughout the entire length of the Tungsten. The most common type of Tungsten used today. Thoriated tungsten electrode provides excellent resistance from weld pool contamination while at the same time offers the welder easier arc starting capabilities and a more stable arc. Generally, they are used for DC electrode negative or straight polarity applications such as carbon & stainless steels, nickel alloys and titanium.

#### Lanthanated Tungsten Electrode

The lanthanated tungsten electrodes are becoming more popular in the circle of welding in the world soon after they were developed, because of their good welding performance. The electric conductivity of lanthanated tungsten electrode is most closed to that of 2% thoriated Tungsten electrodes. Welders can easily replace thoriated tungsten electrodes with lanthanated tungsten electrodes at either AC or DC and not have to make any welding program changes.

#### Cerium Tungsten Electrode

Cerium tungsten electrodes have good starting arc performance under the condition of low current. As the arc current is low, these electrodes can be used for welding of pipe, stainless steel and fine parts. Cerium-Tungsten is the best substitute for Thoriated-Tungsten under the condition of low DC.

#### Zirconiated Tungsten Electrode

Zirconated tungsten electrodes are good at the performance in AC welding, especially under high load current. These electrodes can retain a balled end when welding, which results in less tungsten permeation and good corrosion resistance. It balls up well in AC welding and has a more stable arc than pure tungsten. Especially with excellent performance in high load AC welding, it is not replaceable by any other electrodes. It also resists contamination well in AC welding.

#### Yttrium Tungsten Electrode

Yttrium tungsten electrode mainly applied in military and aviation industry with narrow arc beam, high compressing strength, and the highest welding penetration at medium and high current.

#### Composite Tungsten Electrode

Their performances can be much improved by adding two or more rare Earth oxides which are mutually complementary. The composite tungsten electrodes have thus become out of the ordinary in the electrode family.

#### Tungsten plate

Tungsten plate is widely used in the construction of furnace tooling and parts and as a feedstock for the fabrication of parts for the electronics and semiconductor industries. Surface can be supplied in a shiny or matte; dependent upon thickness and width parameters.

#### Tungsten point/contacts

Tungsten point/contacts are for use in high voltage applications, usually where highly repetitive switching is required. Tungsten has a melting temperature of 3,380°C which gives it excellent arc-erosion resistance. Tungsten may develop troublesome oxide films, especially when used as the anode contact in some DC applications. Therefore, tungsten is often used as the cathode contact, and a palladium alloy used as the anode contact. Such a combination also minimizes contact interface resistance and material transfer.

#### Tungsten sheet

By special processing, produce hot-rolling and cold-rolling products with high quality W slabs, such as W electrode plate, heater, heat-shield and W boats etc, which are used in electronics, electronic-vacuum and illumination etc.

#### Tungsten stream mouth

Tungsten stream mouth is as a special tungsten alloy with other refractory metals. It mainly uses in rare-earth metal smelting, the induction furnace heating element, the quartz glass smelting and so on, makes the high temperature vessel.

#### Tungsten target

Tungsten targets are joined to graphite substrates by a brazing method employing a controlled atmosphere and a suitable braze material such as platinum and an alloy of platinum and chromium.

#### Black Tungsten Wire

All wires showed here are doped tungsten wires and manufactured by the high tech of doping, acid washing, isostatic pressing, PLC controlled direct sintering, swaging and auto feeding. Black tungsten wire products are featured with minimum formation at high temperatures, high recrystallization temperatures, uniformity in dimension and excellent coil ability. For tungsten rod weighing 3kg/pc, its rough welding tungsten wire weighs 5kg/pc. Customers are allowed to choose various types of black tungsten wire in accordance with their specific applications.

#### Cleaned Tungsten Wire

Cleaned Tungsten Wires raised foreign elements and graphite from black tungsten wire. Cleaned Tungsten Wire is the surface of electrolytic polished tungsten wire, and it shall be smooth, clean, gray silver with metal luster. The tungsten wire features excellent formability, long life and super lighting efficiency. Cleaned Tungsten Wires are mainly applied for making various electron tubes, H series auto lamp, halogen lamp and other special lamp.

#### Tungsten Rhenium Wire

Tungsten rhenium wire is used for heating elements in high temperature furnaces, thermocouples and in electronics. Its advantage is its ability to maintain greater ductility compared to tungsten after exposure to extremely high temperatures. Tungsten wire has fiber structure, when the temperature reaches 1500-1600 °C, the tungsten filament would turn, and cause high-temperature sag. To improve the quality of tungsten wire, it is always mixed some additives during sintering procession, such as Na<sub>2</sub>O, K<sub>2</sub>O, SiO<sub>2</sub>, ThO<sub>2</sub> to enhance the capacity of high-temperature creep resistance and high temperature anti-sag of tungsten wire. In order to improve the tenacity of tungsten wire and prevent the deformation under high temperature, it usually added some oxides, such as silica, alumina, potassium and so on.

#### Gold Plated Tungsten Rhenium

Gold plated tungsten rhenium wire is namely tungsten rhenium wire plated with gold. Tungsten rhenium wire is a kind of tungsten wire, made with tungsten and rhenium.

#### Non-sag Tungsten Wire

Non-sag tungsten is tungsten doped with the element of K (potassium) or other elements to achieve the effect of non-sag of the tungsten wire. Doping with K can form bubbles in tungsten wire, which can prevent the recrystallization of the tungsten wire. And they are also responsible for their outstanding low resistance of non-sag tungsten at high temperatures of a glowing lamp filament. About 90% of non-sag tungsten is used in incandescent lamps.

#### Stranded Tungsten Wire

Stranded tungsten wires element features high melting point and high corrosion resistance, mainly applied for aluminizing kinescope, chromo scope, mirrors, plastics and heater elements for decoration articles, Stranded tungsten wire is applied for making heater elements and other heater components in semiconductor and vacuum devices.

#### Gold Plated Tungsten Wire

Gold plated tungsten wire means tungsten wire coated with a layer of gold. Gold plated tungsten rhenium wire is tungsten rhenium wire with gold plated. Tungsten wire and tungsten rhenium wire with gold plated have similar appearance, but different material content. And the properties of tungsten wire and tungsten rhenium wire are differing from each other.

#### Doped Tungsten Wire

Doping in blue tungsten oxide or tungsten oxide mixed with trace  $K_2O$ ,  $Al_2O_3$ . And  $SiO_2$ . Doped tungsten wire, performance is better than ordinary tungsten wire, widely used in microwave ovens, television, welding materials, special lighting.

#### Straightened Tungsten Wire

Straightened tungsten wire is tungsten wire straightened. Straightened tungsten wire includes black straightened tungsten wire, cleaned straightened tungsten wire, and straightened tungsten rhenium wire.

#### Tungsten Filament

The tungsten filament of a vacuum incandescent lamp is heated to temperatures where visible light is emitted by resistance heating. Tungsten filament acts as an electrical resistor, which dissipates power proportional to the voltage applied, times the current through the filament. When that power level is sufficient to raise the temperature to above 1000 degrees Kelvin, visible light is produced.

#### Tungsten Boat

As a special and effective boat vessel, tungsten boat is widely used in metallizing, electron-beam spraying as well as the heat process with sintering and annealing in vacuum coating industries.

#### Tungsten carbide

Tungsten carbide is a dense, metal-like substance, light gray with a bluish tinge, that decomposes, rather than melts, at  $2,600^\circ C$  ( $4,700^\circ F$ ). It is prepared by heating powdered tungsten with carbon black in the presence of hydrogen at  $1,400^\circ-1,600^\circ C$  ( $2,550^\circ-2,900^\circ F$ ). For fabrication, a process developed in the 1920s is employed: the powdered tungsten carbide is mixed with another powdered metal, usually cobalt, and pressed into the desired shape, then heated to temperatures of  $1,400^\circ-1,600^\circ C$ ; the other metal, which melts, wets and partially dissolves the grains of tungsten carbide, thus acting as a binder or cement. The cemented composites of tungsten carbide-cobalt are known by many trade names, including Widia and Carboloy.

#### Tungsten Crucible

Because of the high melting point of tungsten, tungsten crucible is widely used in furnace industry such as heating elements of induction furnace, quartz glass melting furnace, and rare earth smelting furnace.

#### Tungsten ball

Pure tungsten ball is used the material of pure tungsten whose density is over  $19.2g/cm^3$ , and it is the highest density among tungsten balls. Another reason for applicator using pure tungsten ball is that tungsten ball has the highest melting point.

#### Tungsten heavy alloys

Tungsten heavy alloys generally are refractory metal, which have two-phase composites consist of W-Ni-Fe or W-Ni-Cu or even W-Ni-Cu-Fe. They have very high melting point and have a density twice that of steel and are more than 50% heavier than lead. Tungsten content in conventional heavy alloys varies from 90 to 98 weight percent and is the reason for their high density (between  $16.5$  and  $18.75 g/cc$ ).

#### Tungsten needle

Tungsten needles are widely used in the construction of furnace tooling and parts and as a feedstock for the fabrication of parts for the electronics and semiconductor industries. Surface can be supplied in a shiny or matte; dependent upon the thickness and width parameters.

#### Tungsten Copper

Tungsten copper alloy is the composite of tungsten and copper, which own the excellent performances of Tungsten and Copper, such as heat-resistant, ablate-resistant, high-intensity, excellent thermal and electrical conductivity. It is easy to be machined. It is used widely in such industries as engine, electrical power, electron, metallurgy, spaceflight and aviation.

#### Tungsten Copper Heat Sink

Tungsten copper heat sink is a composite of tungsten and copper. By controlling the content of tungsten, we can design its coefficient of thermal expansion (CTE), matching that of the materials, such as Ceramics ( $Al_2O_3$ ,  $BeO$ ), Semiconductors (Si), Kovar, etc.

#### Tungsten Copper Electrode

A combination of the advantages of tungsten and copper, high temperature resistance, electric arc ablation, high intensity, than the major, conductive, thermal conductivity, and ease of machining, and it has features such as cold sweating, as with tungsten high hardness, high melting point, anti-adhesion characteristics, often used to do a certain resistance to abrasion, resistant to high temperature welding, butt welding electrode.

### Tungsten Copper Dart

Tungsten copper darts is a much softer material. In order to show the color of brass, they are generally manufactured with about 70%~80% tungsten. Some darters, especially old-timers, like the grip of these darts as the metal surface develops microscopic pits after they have been thrown for a while. Tungsten copper darts have become much less common in recent years, with Nickel/Tungsten darts becoming the primary type of high-density darts.

### Tungsten Copper Golf Weight

A golf club head includes one or more balance weights for swing balancing the golf club. The balance weight is selected from a plurality of balance weights and mounted in a weight cavity formed in the golf club head. Tungsten alloy is now well known as the best material for this significant role of golf club balance weight. You can have a general impression for how tungsten alloy is applied to balance the golf club's better control from the below pictures demonstration.

### Tungsten Copper LED

The reduced form factor of the Tungsten LED is made possible by a revolutionary new light engine. ASP research developed a Patent Pending technology, which produces 70 lumens (Tungsten 1) to 90 lumens (Tungsten 2) of brilliant white, refocused light. (Note to reader: These are conservative measures. A constant current driver is combined with a mathematically precise collimating cone to achieve unparalleled output.

