俄乌冲突
对钨制品市场与价格的影响
IMPACTS OF RUSSIA-UKRAINE CONFLICT ON TUNGSTEN MARKET & PRICE

DR. HANNS
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作者简介

厦门中钨在线科技有限公司，简称“中钨在线”，是中国第一家钨、钼、稀土行业的电子商务公司，1997 年 9 月以我国第一家顶级钨制品网站 www.chinatungsten.com 为基础在厦门设立。中钨在线以其在钨钼制品领域几十年积累的信息数据和专业经验为基础的设计、制造，卓越的商业信誉和优质服务闻名全球业界，使其成为钨钼稀土，特别是钨化学品、金属钨、硬质合金、高比重合金、钼及钼合金领域的最佳综合应用解决方案提供商。

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BRIEF INTRODUCTION TO THE AUTHOR

As the 1st E-commerce company of Tungsten (W), Molybdenum (Mo), Rare Earth (RE) in China, China Tungsten Online Manu. & Sales (CTOMS) was founded in 1997 based on China's the 1st and top tungsten website www.chinatungsten.com. As its specialized design, professional manufacturing, excellent service and powerful information database, CTOMS is not only the most authoritative information source of Chinese and English information of W Mo and RE products globally, but also the best comprehensive application solution provider of W, Mo and RE, both chemical materials and machined products, such as tungsten oxide, metal, cemented carbide and heavy alloys.

CTOMS has been created more than 1 million web pages and WeChat information message of W, Mo and RE news, price and market research, analysis. The web www.ctia.com.cn and news.chinatungsten.com are the world's top index websites of tungsten which have received 1 billion visits from 1997.

The major business of CTOMS is to complete product design, R & D with customers and provide customers with processing and integration services. In the past 2 decades, it has provided more than 100,000 different types of W, Mo & RE products to more than 10,000 customers all over the world. Years experience and technology accumulation have laid a foundation for promoting the flexible and intelligent manufacturing of customized products.

The professional research articles and reports of CTOMS are written by Dr. Hanns, Miss Sunny Zheng, professional analyst and its marketing team. Dr. Hanns is an expert of the main market and technical research of CTOMS has been engaged in e-commerce and international trade of tungsten and molybdenum products, production and manufacturing of cemented carbide and high specific gravity tungsten alloy since the early 1990s. He is a well-known expert in e-commerce, tungsten product design, processing and Market Research of tungsten and molybdenum products in the industry with more than 30 years of experience. Miss Sunny has been committed to the research of tungsten market, creating and promoting CTOMS social media form many years. She has strong professional delicacy and sensitivity to tungsten products market and price.

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PART I OF X

Brief Introduction to the Conflict between Russia & Ukraine and the Military Use of Tungsten

1. Russia Ukraine Conflict

1.1 The Black Swan Nature of Russia Ukraine Conflict and Sanctions

Not long ago, when the new year 2022 was coming, many research institutions, experts and professional scholars around the world predicted the "Black Swan" event in 2022, most of which focused on the adjustment of China-US relations and bilateral economic, trade, scientific and technological control measures, or the possibility of extreme weather,



The Conflict between Russia and Ukraine may be called a genuine black swan incident

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epidemic and other aspects; Of course, with regard to military and regional conflicts, some people believe that East Asia and the Taiwan Strait may be one of the hot spots. No matter whether the author of this article agrees with their views or not, after reading these research articles, I have benefited a lot, and I am very grateful for their research and contribution!

However, for the analysis of these predictable risks that occur frequently, have traces to follow and have logic in recent years, I think such predictable risks and events should actually be called "grey rhinoceros" events. The real "black swan" is often infrequent and difficult to predict, such as the recent conflict between Russia and Ukraine, which has attracted great international attention.



Whether it is a Grey Rhinoceros or a Black Swan, it is a disaster and helplessness

Since February 24, 2022, Russia has "invaded" Ukraine and launched what they call a war of self-defense, while the United States, the European Union and their allies have launched an “Economic War” of various sanctions against Russia. Not only is the conflict between Russia and Ukraine an outright Black Swan incident, but only the measures of sanctions against Russia by the United States and Europe, such as the implementation of the bank's expulsion from the SWIFT payment system, also have the nature of an indiscriminate black swan; Even Switzerland, a permanent neutral country, has joined the ranks of sanctions, which shows that the conflict between Russia and Ukraine is unprecedented and rarely heard of.

The Russian Ukrainian conflict is undoubtedly the first "black swan" to be remembered by history and fly high in 2022. It not only disrupts the global stock market and commodity market, intensifies the risk of global inflation and supply chain interruption, but also may

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accelerate the disintegration of the "one super multi power" international order since the end of the cold war. It is true that the Russian Ukrainian issue involves not only the military strength struggle between the two countries or multiple global interest subjects, but also the multi-faceted struggle between the political ecology and global political pattern at home and abroad, the all-round resource coordination ability of various countries and regions, economic strength and mobility of various subjects.



Ruble

As a counter measure, at Putin's order, the Russian government immediately pulled out the "unfriendly list" of about 50 countries and regions, including EU Member States (27 countries such as Germany, France, Italy, Spain, the Netherlands and Poland), the United States, the world's largest economy, and San Marino, a small country with a population of only 30000. The vast majority of them are European and American countries and regions, and the Five Eye Alliance is naturally included; There are about 50 countries and regions in Asia, and only four of them are listed in Japan, South Korea, Singapore and Chinese Taiwan. According to the decree signed by Putin, Russian citizens, companies, the state itself, its regional and municipal governments who have foreign exchange obligations to foreign creditors in the list of unfriendly countries and regions can pay their debts in rubles. In order to fulfill its obligations, the debtor has the right to apply to the Bank of Russia to open a class C account in the name of foreign creditors or nominees to pay off relevant debts.

In particular, Taiwan, which legally belongs to China, has always been a follower of the United States, and its personality inevitably makes it one of them! Therefore, like the United States and European countries, China should also be regarded as one of the countries sanctioned by Russia!

Recently, when the conflict between Russia and Ukraine is approaching a month, Russian President Vladimir Putin's counter-measures against the west, listed the list of countries that are not friendly to Russia, and asked these countries and regions to only pay the price of importing Russian energy in Rubles. Such Putin

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style counter-measures are also full of unprecedented arrogance, and are enough to amaze and confuse politicians and financiers all over the world!



The struggle between the US and Russia behind the conflict between Russia and Ukraine

1.2 Oil and Gas Boom and "Demon Nickel" Rampant under Sanctions

Since the war between Russia and Ukraine, European and American stock markets have continued to fall sharply, and NASDAQ has fallen into a bear market. In fact, the stock markets of many countries and regions have fallen into a bear market. "For global investors, this battle is like fighting with their money." However, if we look at the three principles of Russia's withdrawal, "Ukraine stops military operations", "Ukrainian neutrality is incorporated into the constitution" and "recognize that Crimea is Russian territory and the two separate regions in eastern Ukraine are independent", we will know that this war, even if it will not last for a long time, will be difficult to end in the short term, and the global political economy will be difficult to calm in the short term, even if the war ends in the future, We can also foresee whether it will have a significant impact on the world economic pattern and development in the next decade or decades.

The various measures taken by the United States and Russia on sanctions and anti sanctions have resulted in the rapid rise of international oil prices and the continuous decline of the Russian ruble. It can be seen that the United States has a great impact on Russian oil, natural gas and other energy sources, which account for about 8% of its liquid fuel imports. After the shale gas revolution in the United States, the main buyers of Russian oil and gas are the European Union and China. Therefore, the rising energy prices mainly affect the import dependent countries and regions such as the European Union and China. After 2007-2008 and 2011-2014, the international oil price has entered the era of high oil price of more than US $100 per barrel for the third time. Experts estimate that the

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international oil price is close to reaching and may remain high in the second quarter of 2022. Unless the war ends as soon as possible, it is difficult to fall sharply and judge whether it will jump to another high level.



Oil and gas prices have risen again due to the conflict between Russia and Ukraine, and gas prices in Europe have risen nearly 10 times!!!

Since the superposition of high oil prices and the epidemic, countries have launched and continuously increased monetary easing policies, which is bound to push up commodity prices and inflation. At the same time, the study and judgment of the global economy and bulk commodities should not only focus on the Russian Ukrainian war and the Federal Reserve and other monetary policies, but also consider the havoc of Omicron in Japan, South Korea, Europe and the United States, and the continuous friction in economic and trade relations among the world's major economies; For China, we should consider the trend of the relationship between Japan- South Korea, China- South Korea，and China-Japan after the South Korean election and its impact on the economy of East Asia and even the whole Asian economy.

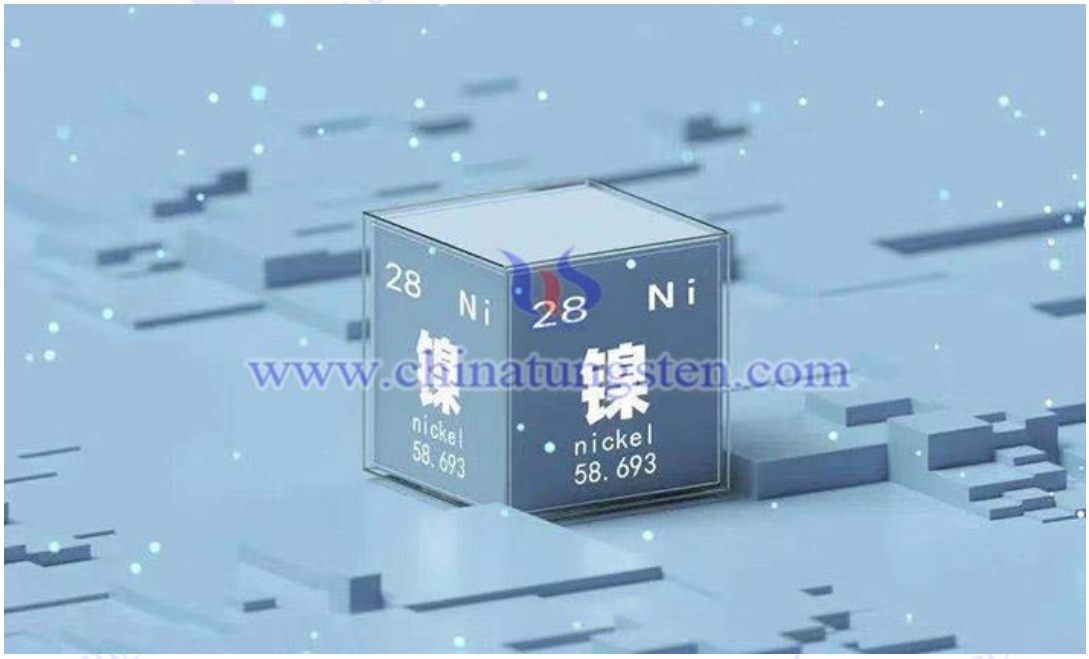
The rise in commodity prices in recent years is mainly due to the mismatch between supply and demand, the fragile supply chain and the loose monetary policy generally adopted by all countries; As for bulk commodities such as aluminum, nickel and wheat, Russia's export volume plays an important role, accounting for 4.2%, 5.3% and 5% of global output respectively. However, we must be soberly aware that affected by the conflict between Russia and Ukraine, prices may rise far more than oil, natural gas, metal aluminum, wheat, corn and other commodities.

Nickel is a kind of non-ferrous metal plate. Nickel is an important industrial metal, which is widely used in iron and steel, machinery, construction, aviation, transportation, chemical

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industry and other industries. Major commodity exchanges such as the London Stock Exchange and the last stock exchange have nickel futures. The usual trend of nickel futures is irregular. There is no obvious market logic and theoretical basis for the sharp rise and fall of nickel futures. The name **"Demon Nickel"** given to it by people in the market has its origin, but it comes from nowhere.



"Nickel" has the same pronunciation as monster or demon in Chinese. Therefore, when the price of it fluctuates abnormally, it was called it "monster nickel" or "domon nickel" jokingly

Russian nickel supply accounted for 40% of the global circulation. The supply concerns, logistics chain disconnection, financial sanctions and other factors caused by the conflict between Russia and Ukraine, coupled with the capital predators in the market trying to take the opportunity to carry out a strong epic short squeeze on Chinese related enterprises with short speculation, LED to a sharp rise in nickel prices all the way. The domestic nickel price quickly climbed to 200000 yuan / ton, and then jumped again. Shanghai nickel closed on March 9 and rose at the price limit of 267700. Originally, under the scenario of tight nickel supply and back to the original market, the nickel price was too strong, and the transportation belonged to the normal range. Then, due to the low inventory of Lun nickel and Shanghai nickel, the demand for new energy was strong, and the long air war was in full swing, Russia and Ukraine were suddenly superimposed, resulting in structural shortage contradictions and psychological panic, resulting in the emergence of "demons". This may be just one of many black swans, or it may be just a preview of a major economic event, but in any case, its butterfly effect will appear soon.

1.3 Observe the Future Trend of Tungsten Price from the Market Situation of Nickel

How does the conflict between Russia and Ukraine affect the tungsten products industry? For the tungsten industry, we have to seriously consider such issues. Modern war is not

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only the destruction of human life, but also the massive consumption and destruction of all kinds of materials. Therefore, the war must be accompanied by a substantial increase in the demand for all kinds of materials, especially strategic related materials and resources. In addition to the direct military demand, the related industries driven by it will also increase. Tungsten products are such a resource.

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Price of Tungsten Products
Chinatungsten Online Mar. 28 2022

Product	Specification/ WO3 Content	PRICE (USD, EXW XIAMEN, CHINA)
Ferro Tungsten	≥70%	29,032.30 USD/Tonne
Ammonium Paratungstate	≥88.5%	333.50 USD/MTU
Tungsten Powder	≥99.7%	45.20 USD/KG
Tungsten Carbide Powder	≥99.7%	44.80 USD/KG
1#Tungsten Bar	≥99.95%	52.40 USD/KG

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Price of Tungsten Products, 28th, Mar. 2022 China Tungsten Online.

As tungsten products are a small commodity, many economists and experts will not notice it, but we believe that tungsten products may be greatly and long-term affected by the Russian Ukrainian conflict. Why do we say so? It is not difficult to draw a conclusion as long as we look at the importance of tungsten products, their main producing countries, their position in the supply chain and their position in the Russian Ukrainian conflict.

Based on the above analysis and taking the lesson of "demon nickel", this paper intends to discuss the importance of tungsten products in military and people's livelihood, the distribution of large countries of tungsten resources reserves and main production and supply countries, the situation of tungsten resources in Russia, the influencing factors of tungsten resources market and price, the feasibility and future prospect of China's tungsten products futures, national regulation This paper analyzes the impact of the conflict between Russia and Ukraine on China's tungsten products industry and the future

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development trend, and puts forward some foolish opinions. The content of this article is like the perspective of a frog at the bottom of a well，I sincerely hope that all experts, scholars and colleagues of tungsten industry will give me more advice and/or suggestions!

2. Tungsten Resource and Its Importance

2.1 Tungsten and Its Characteristics

Tungsten, whose chemical element symbol W comes from Wolfram in English, has an atomic number of 74 in the periodic table and is a metal of VIB group. The density of tungsten is 19.35g/cm3, which is very close to that of gold; Tungsten has a melting point of 3422 ℃ and a boiling point of 5927 ℃, which is the highest among almost all metal elements, so it is classified as a refractory metal among non-ferrous metals. Tungsten is a rare metal with silver white metallic luster, but its shape is very similar to the silver gray of steel in ferrous metals. The chemical properties of tungsten are very stable. It does not react with air and water at room temperature, and does not react with hydrochloric acid, sulfuric acid, nitric acid and hydrofluoric acid of any concentration.

Main Characteristic Indexes of Tungsten			
Chinese	钨	English	Tungsten
Nickname	Heavy stone	English nickname	Wolfram
Element Symbolt	W	Atomic weight	183.84
Element type	metallic elemen	Atomic number	74
Cycle	Sixth cycle	family	VI B family
area Zone l	D	ectronic layout	[Xe] 4f14 5d4 6s2
Element category	Transition metal	elements atomic radius	139pm
Electronegativity	1.7	melting point	3410 ℃
boiling point	5660 ℃	Density	19.35 g/cm³
Water solubility	Insoluble	appearance	Silvery white shiny metal
CAS No.	7440-33-7	EINECSNo.	231-143-9
Danger symbol	F；Xi	Security Description	S6；S26；S36
Hazard Description	R11；R36/38	Discoverer	Carl Wilhelm Scheler
Metal classification	Nonferrous Metals, refractory metals	Year of discovery	1871
		Created By	CTIA GROUP

Tungsten is a rare refractory metal. Due to its high melting point, high hardness, high density, good conductivity, good ductility and small expansion coefficient, tungsten has excellent physical, chemical, mechanical and machining properties. All kinds of tungsten products are widely used in the fields of national economy, national defense industry, aerospace, medical electronics and other fields, and become an indispensable important raw material and functional material in modern social production, The strategic position is very prominent. In the modern industrial system, not only tungsten chemicals, such as tungsten oxide and tungsten chloride, are very important raw materials for powder metallurgy and chemical industry, but also indispensable raw materials for metal

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manufacturing and petroleum smelting catalysis; Moreover, tungsten metal products, high-density gold and cemented carbide products, tungsten copper, tungsten silver and other tungsten alloys and tungsten rare earth doped materials are one of the most important functional materials in the application of modern industrial machining, information technology, photoelectric technology and national defense high-tech. For more information and data on the metallic element tungsten, please visit the website: www.tungsten.com.cn

2.2 Main ProductS Categories of Tungsten

2.2.1 Tungsten Ore and Tungsten Concentrate



Wolframite ore

Few metallic tungsten is found in nature. Tungsten mainly occurs in the form of more than a dozen minerals. China mainly has wolframite [(FeMn) WO4, tungstate of manganese and iron] and scheelite (CaWO4, calcium tungstate). Wolframite is the most important tungsten ore in China, and it is also the first new ore in southern Jiangxi; Scheelite is mainly produced in Dayu, Xiushui, Jiangxi, Rucheng, Anhua, Linwu, Luanchuan, Henan, Wenshan, Yunnan and other places. After years of development, utilization and technological progress, China mainly adopts the hydrometallurgy process to prepare all kinds of tungstate, and then uses the powder metallurgy method to produce and process all kinds of metal and alloy products of tungsten; Ferrotungsten is directly produced by pyrometallurgy with tungsten ore. More information is available at www.chinatungsten.com

2.2.2 Tungsten Oxide, Sulfide and Other Tungsten Compounds

After tungsten mining, various tungsten products are obtained through different

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processing procedures. Tungsten and the main products containing tungsten include (1) tungsten compounds, namely tungsten oxide, tungsten chloride, tungsten sulfide, tungsten fluoride and other tungsten chemical raw materials with various particle sizes, which is the intermediate product with the largest output of tungsten (2) metal tungsten powder prepared after the reduction of tungsten compounds; (3) Tungsten carbide powder obtained by heating and carbonization of tungsten powder. These two powders are the most important forms of tungsten powder; (4) Tungsten bar, tungsten wire, tungsten plate, tungsten foil, tungsten boat and other metal tungsten products; (5) Alloy products with tungsten as the main raw material, such as two-phase and three-phase alloys of tungsten, high specific gravity alloys and cemented carbides; (6) All kinds of chemical and metal products containing tungsten, such as catalysts, pigments, tungsten steel, etc.



Blue Tungsten Oxide （BTO）

In recent years, we have continuously produced various tungsten compounds, especially nano-sized Purple Tungsten, cesium tungsten and other ammonium tungstate. It is also an important material in the fields of optics, optoelectronics, photovoltaic, building materials and new energy. For everyting details about yellow and blue tungsten oxide and trixode, please visit www.tungsten-oxide.com

2.2.3 Tungsten Metal Products

Specifically, common tungsten products include metal tungsten products such as electrodes and tungsten wires. Conventional metal tungsten electrodes and tungsten wires are mostly doped with tungsten electrodes and tungsten wires. Some electrodes often add rare earth elements, such as tungsten lanthanum, tungsten thorium, tungsten yttrium, tungsten cerium and other electrodes. More information is available at www.tungsten-heater.com.cn

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Tunsgten Electrode

2.2.4 High Specific Gravity (High Density) Tungsten Heavy Alloy Products

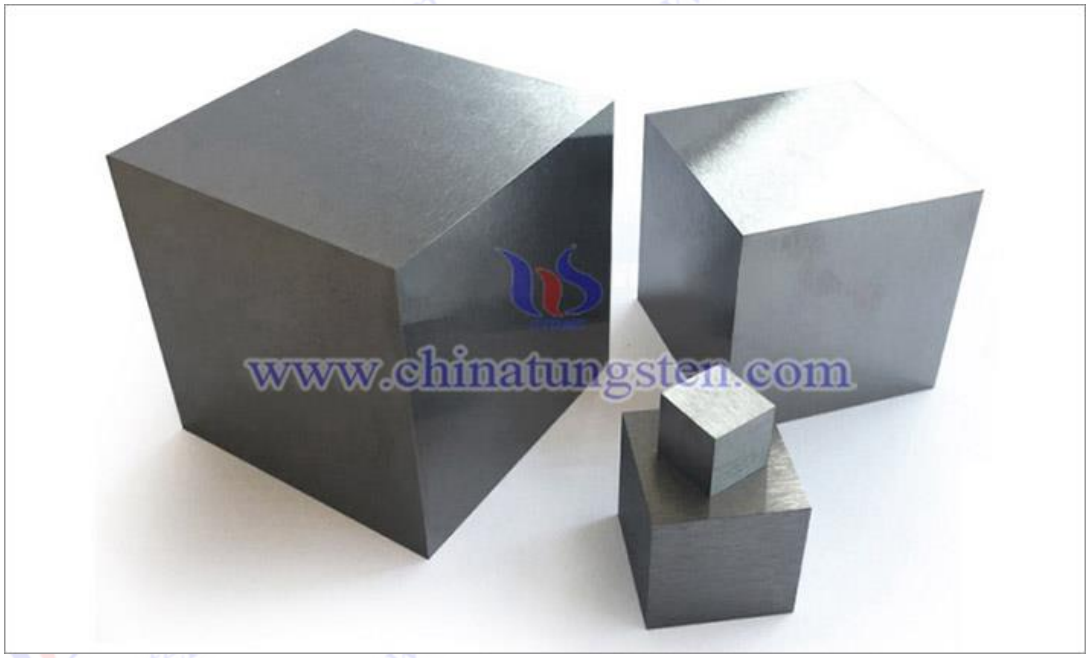
Tungsten alloy, also known as high-density tungsten alloy, heavy alloy and high specific gravity tungsten alloy (WHA), is another most important tungsten alloy product besides cemented carbide, and it is also the fastest developing field of tungsten products in recent years. Tungsten alloys can be divided into non-magnetic alloys (wnicu) and magnetic alloys (wnife or wnicufe). The tungsten content is generally between 80% and 97%. Some special uses will also process tungsten alloys with 70-75% content. At the same time, in order to achieve the required performance, a small amount of bonding agents of other metal elements such as cobalt (CO), molybdenum (MO), chromium (CR) will also be added.

The density of high specific gravity tungsten alloy is generally 14.0 ~ 19.0g/cm3. The two main tungsten alloys in China Tungsten online production are: W-Ni-Cu and W-Ni-Fe series. Tungsten alloys have a series of excellent characteristics, with a large proportion: the general specific gravity is 16.5-18.75g/cm3; High strength: the tensile strength is 700-1000mpa; Strong ability to absorb rays: its ability is 30-40% higher than that of lead; High thermal conductivity: 5 times that of die steel; Small coefficient of thermal expansion: only 1 / 2-1 / 3 of iron or steel; Good conductivity; It has good weldability and machinability.

Of course, tungsten alloys also have many two-phase alloys, such as tungsten copper alloy, molybdenum tungsten alloy, niobium tungsten alloy, tungsten nickel alloy, tungsten gold alloy, tungsten silver alloy, etc. according to different physical properties, these alloys have different production processes and uses. Tungsten copper alloy is an important two-phase tungsten alloy with large output. It is mainly used for electronic packaging, conductive materials of electronic and electrical facilities and equipment, contact switch materials, etc.

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www.tungsten-alloy.com is a website built by China Tungsten Online in the late 1990s, which mainly introduces the tungsten alloy products it manufactures. It is also the most authoritative, comprehensive and well-known website in the field of tungsten alloy. You can visit this website to get more comprehensive treatment of products and their uses.



Tungsen Heavy Alloy WHA Cubes, Blocks

2.2.5 Tungsten Cemented Carbide

Tungsten Cemented Carbide also named Tungsten Steel, Sintered Tungsten Cemented Carbide and Cemented Carbide. It is the largest consumption of tungsten and the most important tungsten alloy product exported by China to the international market.

Silver gray powdered tungsten powder is produced by conventional powder metallurgy process. Generally, tungsten oxide is deoxidized after heating in hydrogen or other gas atmosphere to protect metal powder from oxidation; After this process, an appropriate amount of carbon black is added into the tungsten powder to heat to make it penetrate and diffuse each other, so that the metal tungsten powder is carbonized to form tungsten carbide powder (WCP). Metal tungsten powder and tungsten carbide powder are generally divided into coarse, medium and fine products according to the particle size range. In addition, they are ultra coarse tungsten powder or tungsten carbide powder. Of course, with the continuous improvement and improvement of production technology, the current tungsten powder production has been very close to the nano particle size. This kind of tungsten powder is called ultra-fine tungsten powder or tungsten carbide powder, nano tungsten powder or tungsten carbide powder. Tungsten powder is the raw material for producing and processing metal tungsten materials, tungsten alloys and other metal tungsten-based products. Tungsten carbide powder (WCP) is a black hexagonal crystal with dark gray powder and metallic luster. It is the main raw material for the production of

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cemented carbide. Its chemical formula is WC. Tungsten carbide powder is often added with the mixture of titanium carbide, tantalum carbide or other carbonized metals to improve the hardness of cemented carbide products with this raw material on the basis of high bending strength and tensile strength.



Tungsten Cemented Carbide Rods

Due to the high melting point of tungsten metal, the conventional production process can not basically adopt the melting process and then carry out casting, die casting and other molding technology according to the low melting point metals such as steel or copper, aluminum, lead and zinc. Therefore, the manufacturing process of tungsten alloy, including the production process of cemented carbide, is a typical powder metallurgy manufacturing process.

The basic steps of conventional cemented carbide manufacturing are (1) proportioning: proportioning with tungsten carbide powder with suitable particle size meeting the product performance requirements and metal binders such as cobalt and nickel in a certain proportion; (2) Mixing: add non-metallic binders such as alcohol, paraffin, gasoline or glycerol and conduct wet grinding in a wet ball mill for 24-48 hours to fully mix and crush them, and then dry, granulate and screen them to obtain cemented carbide mixture (ready to press powder RPP); (3) Put the cemented carbide mixture after granulation into the mold processed according to the size requirements of the final cemented carbide products, and apply appropriate pressure to make it have corresponding strength and reach appropriate batching density; (4) The burden formed by pressing for days is sintered in the sintering furnace at an appropriate temperature and time to melt the metal binder to produce liquid phase sintering state. The hardened tungsten carbide powder and bonded metal cobalt nickel form eutectic alloy. The hardened phase is distributed in the grid composed of bonded metal, cooled, fixed and closely combined into one to form hard alloy wool burden; (5) Inspection and testing: after the product quality meets the requirements, many hard alloy wool ingredients can be directly sold or used as commodities; (6) Fine machining or coating treatment and other processes support all kinds of cemented carbide

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cutting tools and tools; (7) Carry out more customized and personalized processing according to subsequent uses.



TTungsten Cemented Carbide Grounded Ball

Cemented carbide has high hardness. The hardness of cemented carbide is not only second only to diamond, but also has good strength and toughness, high wear resistance and corrosion resistance. Therefore, it is known as "industrial tooth". It is widely used as cutting tools, cutting tools, drilling tools and wear-resistant parts such as turning tools, milling cutters, planers, drill bits and boring tools. It is used in non-ferrous metals, plastics, chemical fibers, graphite, glass, stone, steel Bamboo and wood equipment have to be cut. Of course, almost all materials such as heat-resistant steel, stainless steel, high manganese steel and tool steel with high strength and hardness in our daily life also cut iron like mud with cemented carbide. Cemented carbide can also be used to make rock drilling tools, mining tools, drilling tools, measuring tools, wear-resistant parts, metal abrasives, cylinder liners, precision bearings, nozzles, hardware molds (such as wire drawing molds, cold stamping molds, bolt molds, nut molds, and various fastener molds. The excellent performance and long-life performance consistency of cemented carbide make it have a broader market prospect than die steel and other materials.

In the modern industrial system, no matter the traditional fields such as military industry, machining, metallurgy, oil drilling, mining tools and construction, or the fields such as aerospace, electronic communication, chip manufacturing and photovoltaic, they have become the main tool materials. With the continuous development of upstream and downstream industries and the continuous expansion of peripheral products, cemented carbide will have greater and greater market demand with the continuous improvement of its performance; In addition, in the future, the manufacturing of high-tech weapons and equipment, the progress of cutting-edge science and technology and the rapid

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development of nuclear energy will greatly increase the demand for cemented carbide products with high technology content, high quality and stability.



Tungsten Ccemented Carbide Cutters

3. Main Application of Tungsten

Tungsten products are widely used and developing. At present, they are mainly used in steel smelting, electronic field, chemical field, intelligent building, oil drilling and mining, medical field, nuclear energy field, sports equipment, aerospace, fashion art, etc. Of course, the application of tungsten products in the military field has made tungsten the basis of strategic materials.



High Purity Tungsten Flux (Granule) for Carbon Sulfur Analysis

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In view of the above excellent functions of the above-mentioned high specific gravity alloy, it is widely used in aerospace, aviation, military, oil drilling, electrical instruments, medicine and other industries. We can roughly divide it into the following categories: (1) nuclear materials for nuclear industry, medical treatment and scientific research, such as blocking uranium, uranium and gamma rays γ Radiation proof tungsten alloy shields for facilities and equipment such as X-ray, radiation proof injection protection devices for medical radiotherapy agents, medical tungsten alloy ray shielding materials, tungsten alloy grating blades, tungsten alloy protective cans, shielding needle tubes and tungsten alloy memories, as well as collimators for tungsten alloy series inspection container systems in medical linear accelerators and nuclear technology applications; (2) Tungsten alloy dart rod, dart barrel, golf club counterweight, fishing rod counterweight, tennis racket dessert counterweight, submarine suit, formula F1 racing car, children's Wooden racing car and other equipment and vehicle counterweight, (3) counterweight of all kinds of manned, unmanned boats, submarines, submarines and other underwater and underwater transportation, scientific research and other vehicles; (4) Military and civilian, manned and unmanned aircraft, helicopters, spacecraft, spacecraft, satellites, rockets, missiles, space stations and other counterweight components and anti radiation and gyroscope components; (5) Oil drilling platform, drill pipe and other counterweight rods and counterweight parts; (6) Watch, mobile phone vibrator, game console, tungsten alloy eccentric wheel and tungsten alloy vibrator, etc; (7) Tungsten alloy bullet head, armor piercing bullet core, armor piercing bullet core, tungsten alloy prefabricated broken pieces, grenade fragments, aviation high explosive bullet fragments and fillers, shotgun shrapnel, among which the shell armor piercing bullet made of tungsten alloy rotary forging rod can easily penetrate the armor and composite armor with large inclination angle; (8) Tungsten alloy electrical materials such as high specific gravity electrical contacts and contacts in air circuit breakers.



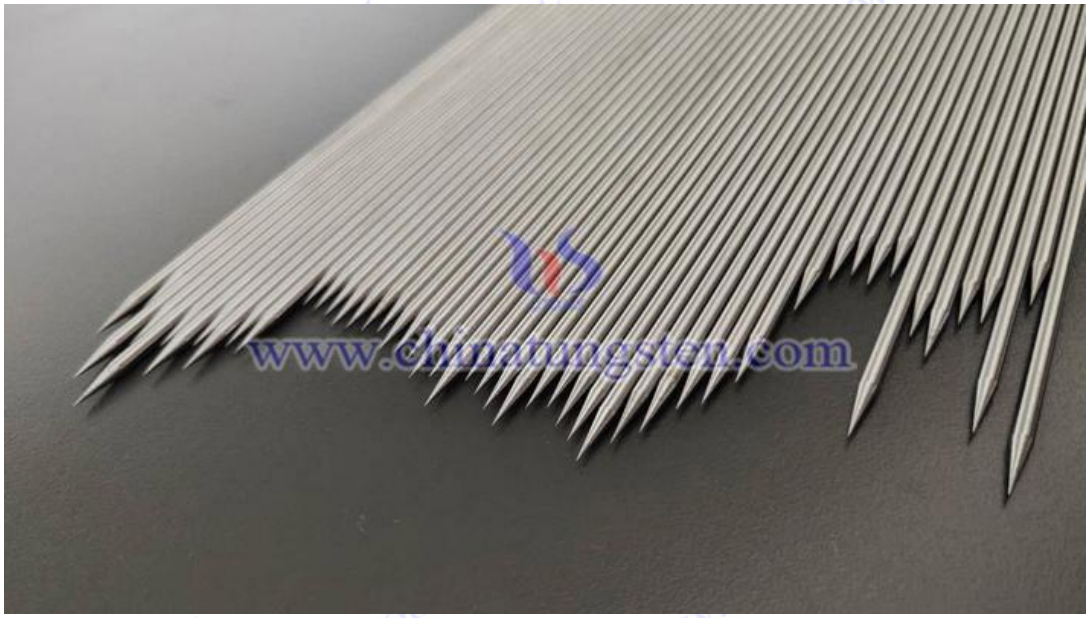
Tungsten Putty for fishing

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4. Application of Tungsten in Military

Tungsten is an irreplaceable and non renewable important strategic metal resource in the field of national economy and modern national defense. It is listed in the list of key minerals by Europe, America and other countries. It is also one of the specific minerals for protective mining in China. Due to its advantages of high melting point, high specific gravity, high hardness, corrosion resistance, oxidation resistance and good ray absorption capacity, in addition to being widely used in civil products, tungsten products are widely used in aerospace nuclear weapons and other military industries.



Tungsten Alloy Underwater Submachine Gun Bullets

The application of tungsten products in the military field is divided into two main aspects, that is, tungsten is directly made and processed into products with military purposes and purposes as raw materials; On the other hand, cemented carbide tools are also indispensable tools in the field of military industry.

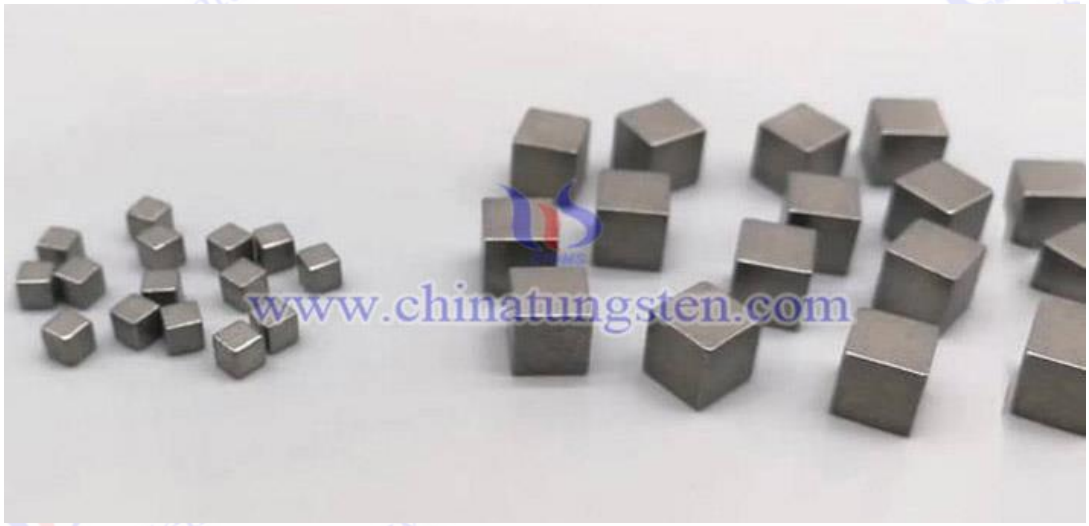
4.1 Military Use of Tungsten Products as Raw Materials

As outlined in point 9 above, tungsten products have been used to replace traditional lead and depleted uranium materials to manufacture various types of tungsten alloy high specific gravity or armor piercing bullet cores, shaped charge covers and prefabricated fragments made of cemented carbide due to their non-toxic and environmental protection properties. Tungsten core materials are used to improve the breakdown power, so as to reduce the pollution of military materials to the ecological environment. In addition, due to the characteristics of strong hardness and good high temperature resistance, tungsten can make the combat performance of the prepared military products more superior. In addition to the above military products, tungsten can also be used in nuclear material storage and

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transportation, aerospace, navigation, atomic energy, shipbuilding, automobile industry and other fields; For example, for navigation gyroscopes or counterweight parts such as missiles, rockets, submarines, aircraft, aircraft carriers, satellites and torpedoes, tungsten alloy is used to improve instrument accuracy and instrument stability; Another example is that the throat lining, nozzle, gas rudder or nuclear fuel reservoir, reactor shielding materials of rocket engine adopt tungsten alloy to adapt to extreme environments such as high temperature and radiation.



In the past ten years, China Tungsten Online has successively designed and produced precision device accessories for navigation and counterweight for many UAVs, unmanned aerial vehicles, unmanned land vehicles, unmanned or manned deep diving devices, etc. In recent years, China Tungsten online has also designed and used 3D printing as manufacturing technology and special spherical powder as raw materials for customers for many times. The production and technology of such products will also be continuously applied in the complex design of military and civil fields.



Tungsten Alloy Shotgun Pellets

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The most important military use of tungsten alloy is its armor piercing and armor breaking ability brought by its high kinetic energy. Tungsten has the characteristics of high density, high hardness and high temperature resistance. It is often used to manufacture tungsten alloy bullets, prefabricated fragments, missiles, kinetic armor piercing bullets, armor and shells. Tungsten alloy armor piercing bullet is a projectile that penetrates armor and destroys targets by relying on the kinetic energy of tungsten alloy bullet core. Due to the high density of tungsten, tungsten in the same volume is heavier than iron in the same volume. The armor piercing bullet core made of tungsten alloy is a high specific gravity tungsten alloy product, which has the characteristics of high density, excellent thermal stability and high section density, which can make the ammunition more stable in the flight process. Tungsten alloy armor piercing projectile is mainly composed of hood, core, body and tracer tube. The core is the main body of this armor piercing projectile, which is made of high-density tungsten alloy. The shell body is made of low-carbon steel or aluminum alloy to support the core. The upper part of the shell body is equipped with guide belt, which can ensure the stable rotation of the projectile. When the tungsten alloy armor piercing projectile collides with the armored target, the shell body breaks, and the internal core undertakes the most important armor piercing task.



AHEAD Air Defense Ammunition

Compared with the traditional armor piercing projectile, the tungsten alloy armor piercing projectile is not filled with explosives, and the high-speed flying tungsten alloy bullet core is enough to produce strong lethality. When the tungsten alloy armor piercing projectile breaks through the armor of targets such as tanks, the high-speed splashing armor fragments and armor piercing bullet core fragments can easily kill the combatants and key equipment in the armored targets. At this stage, tungsten alloy armor piercing projectile is one of the most advanced armor piercing projectiles in the world. In addition to its strong

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armor piercing ability, tungsten alloy armor piercing projectile also has the characteristics of small core diameter, which is only one-third to one-half of the caliber of artillery, which makes tungsten alloy armor piercing projectile have stronger vertical armor piercing performance than traditional armor piercing projectile.

Although the performance of tungsten alloy armor piercing projectile is so excellent, which is called green ammunition or green bullet. Tungsten, metal lead and depleted uranium have similar anti shielding or armor piercing ability, but they do not pollute the environment. However, we found that in the battlefields of Iraq, Kosovo and Syria, the armor piercing shells equipped by American tanks are radioactive depleted uranium armor piercing shells. By using high-strength, high toughness and high-density depleted uranium alloy to replace tungsten alloy, the armor piercing performance of depleted uranium armor piercing shells is better than that of tungsten alloy armor piercing shells. In the Gulf War, the United States used a large number of depleted uranium armor piercing bombs and achieved good results. The reason why the United States prefers to use depleted uranium armor piercing bombs is not only that the armor piercing performance of depleted uranium armor piercing bombs is better than tungsten alloy armor piercing bombs, but also because the United States is unwilling to be controlled by others. After all, the United States is not a large tungsten producing country. Moreover, depleted uranium, a by-product of a large number of nuclear weapons productions in the United States, has to find a "suitable" use.

For more applications of tungsten products in military industry, please check the online website of China Tungsten:
http://www.tungsten-alloy.com/chinese/military-tungsten-alloy-gas-vane.html



4.2 Cemented Carbide as Cutting Tools for Military

Tungsten is also the most widely used and highly consumed tool material, which can improve the production efficiency of the arms industry. On the one hand, tungsten

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containing tool steel is often called high-speed steel. It is a high-quality material for all kinds of cutting tools, molds and appliances; Tungsten based cemented carbide has high hardness, strength, wear resistance and corrosion resistance. It is known as "industrial tooth". It is used to manufacture cutting tools, cutting tools, cobalt tools and wear-resistant parts. It is widely used in military industry, aerospace, machining, metallurgy, stone oil drilling, mining tools, electronic communication, construction and other fields. With the development of downstream industries, the market demand for cemented carbide is increasing. In addition, in the future, the manufacturing of high-tech weapons and equipment, the progress of cutting-edge science and technology and the rapid development of nuclear energy will greatly increase the demand for cemented carbide products with high technical content and high-quality stability.



Machining Tools with Tungsten Cemented Carbide Cutters

As we all know, the field with the largest consumption of tungsten products is cemented carbide, which is a high hardness alloy material made of tungsten carbide powder by powder metallurgy process after adding nickel, cobalt and other metal carbides and bonding metals. Cemented carbide has a series of excellent properties, such as high hardness, wear resistance, good strength and toughness, heat resistance and corrosion resistance. Especially at 500 ℃ - 1000 ℃, it still has high hardness and wear resistance, which makes cemented carbide widely used as tool materials, such as turning tool, milling cutter, planer, drill bit, boring cutter, etc. for cutting cast iron, non-ferrous metals, plastics, chemical fiber, graphite, glass, stone and ordinary steel. Of course, Cemented carbide is also commonly used to cut refractory steel, stainless steel, high manganese steel, tool steel and other difficult materials.

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Tungsten Cemented Carbide Coated Blades and Cutters

The first part of this paper is only the author's analysis and judgment of the price trend of tungsten products in 2022, including the conflict between Russia and Ukraine and the military use of tungsten. In the context of the Russian Ukrainian conflict at the beginning of 2022, we believe that Europe and the United States continue to increase sanctions against Russia. Although the Russian Ukrainian negotiations are beginning to dawn, the sequelae of the conflict and the aftereffect of sanctions will continue to appear, and will continue to affect the global political and economic pattern and the market trend and price trend of major commodities in 2022. Strategic metals such as tungsten, molybdenum and rare earth are the same as many bulk commodities related to the national economy and the people's livelihood, Under the counter cyclical background of the booming counter trend of the national defense industry, the consumption demand of its important strategic raw materials tungsten and rare earth is bound to increase.

(THE REMAINING PART I TO X WILL BE CONTINUED)

This article is published on the official account of WeChat on March 20022, and is also listed at www.ctia.com.cn and news.chinatungsten.com.

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SUMMARY

Different from the experience of tungsten products market in the past few decades, we judge that the price of tungsten products will continue to rise in 2022, but the main factor is not traditional market factors. Therefore, we will start from the global resource distribution and resource competition of tungsten products, the increasing pressure on the production cost of tungsten products, monetary and financial policies of all countries in the world, inflation and many other factors, In particular, we will comprehensively analyze the main factors and possibilities of the rise and fall of tungsten product prices in 2022, and we will also discuss the feasibility and risks of China's Tungsten product futures; Since it is related to Russia, finally, we will briefly analyze the suspected fraud such as the so-called sky high price "Russian tungsten gold bar" that has appeared from time to time in recent decades.

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