MARKET & PRICE TREND OF TUNGSTEN

CHINA, 2021

2021 中国钨制品价格与市场趋势管窥

DR. HANNS

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MARKET & PRICE TREND OF TUNGSTEN

CHINA, 2021

PART I of VII

Macro Environmental Factors Affect China's Tungsten Market

Last Friday, June 25, 2021, when COVID-19 was spreading over the year of global hardship, the market for tungsten products also seemed to be in a stewed pot surrounded by high prices of surrounding products, and the heat and pressure gradually gathered. Manufacturers ceased their quotations and waited for the outbreak of tungsten products market.

Since 2021, compared with the rising market price of molybdenum products, the market and price of tungsten products has been tepid for a long time; At the same time, in addition to the relatively high share prices of China Tungsten Hightech Materials and Xiamen Tungsten because they have good tungsten mineral resources and new energy products, the share prices of listed companies such as Guangdong Rising Nonferrous Metals, Chongyi Zhangyuan Tungsten and Guangdong Xianglu Tungsten have been running at a low level for a long time in the first half of the year.

“One Belt, One Road”, and the other, we should take a look at the current situation of the tungsten industry. We should make a brief analysis of the impact of various factors on the current market of tungsten products, such as inflation, market factors, seasonal factors, epidemic factors, American and/or Euro’s infrastructure plan in the future and G7’s "one belt and one road" as it said, exchange rate of RMB, carbon neutral and carbon tax, Sino-US trade relationship and so on at least eight aspects.

Our basic judgment is that the market will basically remain at a high level in the second half of 2021. We only provide some ideas on how the future market of tungsten products will change, but it is still difficult to judge the rise range and the duration of market high.

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△Tungsten Price Trend in June 2021



△Trend Chart of Tungsten Price,2020-2021

1. Inflation Factors

On June 24, the August light crude oil futures price on the New York Stock Exchange closed at US $73.30 per barrel; In August, Brent crude oil futures closed at US $75.56 per barrel,

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and the two cities have recovered the land lost since last year's negative oil price. The rise in international oil prices has also increased domestic concerns about imported inflationary pressure.



△Brent Crude Oil Futures Trend Chart

The main pressure of imported inflation comes from the increasing huge bail-out printing and bottomless quantitative easing in the United States since the epidemic in 2020. Although the hawkish interest rate hike of the Federal Reserve is released, it is still difficult for the market to get out of the shadow of huge US bonds.

The impact of imported inflation on China is mainly reflected in the price of industrial products. According to statistics, by April, China's PPI had increased by 0.3%, 1.7%, 4.4% and 6.8% respectively year-on-year, and showed a rising trend. In May, affected by the sharp rise in the prices of international commodities such as crude oil, iron ore and non-ferrous metals, PPI increased by 9.0% year-on-year, an increase of 2.2 percentage points over the previous month, reaching a new high in recent 13 years.

In this regard, "market players have two concerns: one is whether the imported inflation pressure will continue to push up the rise of domestic PPI and then transmit it to CPI; the other is whether the poor transmission of PPI to CPI will lead to the increase of operating costs of the middle and lower reaches of manufacturing industry and squeeze the benefits of the industry."

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△Trend Chart of China's Consumer Price Index CPI and Industrial Product ex Factory Price Index PPI

From the perspective of PPI transmission to CPI, the prices of gasoline and diesel increased by 22.0% and 24.2% respectively year-on-year, which is bound to bring great upward pressure on the production cost of high energy consumption in the smelting and processing of tungsten products in China; At the same time, the price of raw materials and gas for the smelting of downstream industrial consumer goods based on crude oil, such as plastics, industrial acid-base salts and other tungsten products, rose under the pressure of cost transmission.

Recently, the national Standing Committee has repeatedly pointed out the problem of commodity price rise, focusing on comprehensive measures to ensure commodity supply, curb its unreasonable price rise, and prevent transmission to consumer prices. A series of measures also confirm that the pressure and urgency of imported inflation are indeed great.

Compared with tungsten products, the price of molybdenum products has reached new highs, and even the CIF price of molybdenum ore has changed three times a day, which is the best example of imported inflation. Taking Luoyang molybdenum industry and other

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index large molybdenum smelting enterprises as an example, under the condition of insufficient supply of molybdenum concentrate in China, a large number of imported products are imported, and the prices of imported products are inevitably rising like iron ore and other large imported industrial products under the situation of rising costs in US dollars such as international mining, processing and freight.

Tungsten ore resources are mainly concentrated in China. Although China's imported tungsten concentrate continues to increase in 2021, it only accounts for a small part of the market. Therefore, unlike molybdenum products, tungsten products are less and are directly affected by imported inflation for a period of time, that is, they benefit from (1) imported inflation accounts for a relatively small proportion in the tungsten products industry chain, (2) Imported inflation is transmitted slowly in the tungsten products industry chain, which is the main reason why tungsten products have not been greatly affected by imported inflation for a period of time.



△Tungsten Ore

2. Market Factors

The price of goods is not only the response of money supply and liquidity, but also the direct feedback of the relationship between supply and demand in the local market.

Under the correct epidemic prevention measures and economic stability maintenance policies of the Chinese government, although the main demand indicators of China's

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economy as a whole have not yet returned to the pre epidemic level, from the perspective of supply and demand fundamentals, due to the good domestic infrastructure, the stable and orderly operation of all links, the rapid growth of production and supply, and the high level of capacity utilization of tungsten products processing enterprises, In a short time, tungsten products market is different from other non-ferrous metals, and there are no major factors in supply and demand fundamentals to support the sharp rise in prices.



△Containers Full of Import & Export Goods Are to be Loaded & Unloaded at the Port

Copper, Aluminum, Lead and Zinc are mainly consumed in the domestic market, and some are processed into finished products at home and then exported to the international market. Due to the stable and well controlled domestic epidemic situation, the industrial and commercial operation rate has returned to the pre-epidemic level, and the people's livelihood consumption is basically not affected by the epidemic situation. In addition, the epidemic situation in Southeast Asian countries has affected the production and supply chain, most of the products that have been transferred out of China have to be transferred to Chinese suppliers, such as epidemic prevention materials, 3C, textile and other civil and biological resources. In this way, other non-ferrous metal products are faced with (1) imported inflation in the international market, with raw materials entering the processing end of the domestic market, (2) at the same time, the domestic and international market demand is increasing, (3) due to the reduction of waste recycling supply due to China's strict environmental protection and other measures, the result of US dollar water release is constantly amplified, The price rise of foreign raw materials combined with the demand brought by China's unique economic growth has led to the continuous price rise of large

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raw materials such as steel and non-ferrous metals.

In addition to the impact of import and inflation on the tungsten products market, unlike other non-ferrous metal industries, the raw materials of tungsten products mainly come from China, and the consumer side also accounts for a large proportion in the international market, that is, in addition to domestic consumption, tungsten products are mainly supplied to the international market. Under the macroeconomic environment of no flood of domestic monetary policy and low inflation, there is no inflation output, so the supply of tungsten products to Chinese processors is less affected by the epidemic and lasts a short time. There is no danger of supply, so the price of tungsten products in the international market has not increased significantly.

3. Seasonal Factors

As the northern hemisphere enters summer, the number of people driving around the world has increased sharply, which has also brought certain seasonal incentives to the rising consumer prices of oil and other commodities. The northern hemisphere concentrates the world's major population and developed industrial countries, so the summer and autumn season in the northern hemisphere is the main season for people's consumption. Although the current "core shortage" is serious, the demand for new energy vehicles and 3C products will also bring a significant increase in the market demand for tungsten products.

Seasonal factors mainly affect tungsten products in several aspects: (1) the increase of air conditioning consumption in summer will inevitably lead to peak valley adjustment of power use in high energy consuming enterprises and pressure to reduce power cost; (2) Tungsten mining, which is mainly concentrated in the south of China, is affected by rainy, typhoon and debris flow in summer to varying degrees.

4. Epidemic Factors

COVID-19's influence on tungsten products market has two contradictory sides.

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△COVID-19 Vaccine

First of all, with the gradual launch of the vaccine and the beginning of the summer holiday, the western economic powers dominated by G7 will gradually unseal, the economy will gradually recover, and the market demand will grow rapidly. However, on the other hand, the "delta" variant virus that has seriously affected countries all over the world recently has re closed many countries, and industrial production and consumption will be adversely affected. According to our customer survey, many customers in western countries have not fully returned to work since the epidemic, and production has been greatly affected.

On the other hand, the international logistics and industrial supply chain disrupted by the epidemic has not been restored, and the logistics price and transportation time have more or less affected the international supply and demand of tungsten products. Therefore, the impact of the epidemic on the international market of tungsten products is complex and multifaceted.

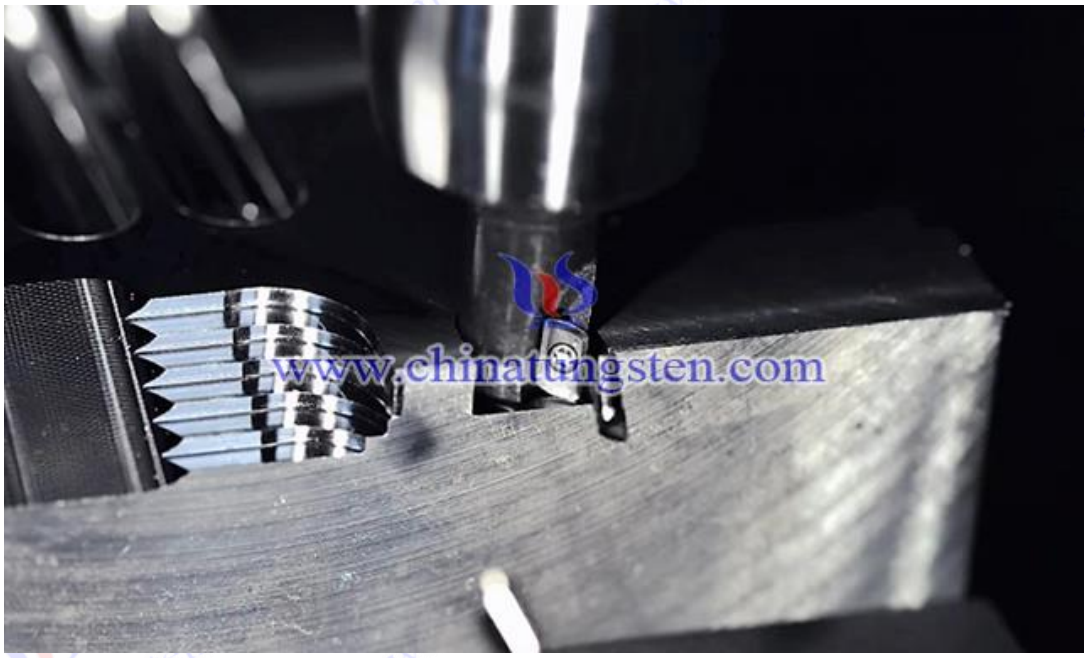
5. American Infrastructure, and G7's So-Called "One Belt, One Road"

Last Thursday (June 24), U.S. President Biden reached a preliminary agreement with a group of democratic and Republican senators on a $579 billion infrastructure spending plan, enhancing investors' optimism that the economic recovery has a firm foothold. Although Biden did not reach the trillions of dollars of infrastructure budget, based on the past practice of the United States, American infrastructure is estimated to be protracted

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and the cost is rising. However, the trillions of Yuan of infrastructure is very good news for the future market of cemented carbide tools.



△Cutting Application of Cemented Carbide Tools

China's "One Belt, One Road initiative" has been thrown out during the trip to Europe, which is not long ago. Biden's "active return to the better world, meeting the needs of the low-income countries and huge infrastructure needs" is called B3W. The plan aims to meet the infrastructure needs of developing countries, and the pool is expected to reach as much as 40 trillion dollars. The United States and its Western allies have drawn such a big cake. When to implement it and how much it can invest are still the moon in the water. However, no matter how they are implemented and how effective they are, it is a long-term positive factor for China's tungsten products as a major supplier.

"One Belt, One Road" and infrastructure boom, which we harbor evil designs in China, Europe and India, should gradually increase the price of products with superior industries. We can not stop others from building new and old infrastructure, but we can take a ride on the banner of demand and sell a good price. Take advantage of our first mover advantage in infrastructure construction and make more money. Such as steel, cement and other key raw materials, tungsten, molybdenum, rare earth infrastructure and new energy must be **"Teeth"** and **"Monosodium Glutamate"**.

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△Infrastructure

6. The Factor of Exchange Rate of RMB

In the pattern of international trade, China's tungsten products are mainly exported, and only a small amount of primary raw materials and tungsten alloy waste are imported. The export price priced in non RMB is affected by the exchange rate of RMB against the US dollar, especially when the exchange rate fluctuates greatly.

Last Thursday (June 24), the US dollar index was 91.8177, with little change, and the US dollar remained basically stable. On the other hand, Comex Gold futures in August fell 0.4% to US $1776.70/oz. Market analysts said that the gold price was taking a breather after the US Federal Reserve took a hawkish position last week, but concerns about possible interest rate hikes and the US Federal Reserve's reduction of asset purchase plan still weighed on gold market sentiment, The US dollar index is expected to remain relatively stable.

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△Trend Chart of US Dollar Index

In view of China's effective epidemic prevention and control, the rapid recovery of domestic production, the substantial increase and rising trend of exports of various products, which has formed a more favorable situation for China's exports than before the epidemic, China's central bank did not release water synchronously with the US dollar to offset the impact of the passive appreciation of US dollar printing, but on the one hand, controlled the amount of RMB, We maintained a moderately loose monetary policy.

On the other hand, we relaxed the restrictions on the RMB exchange rate and tolerated the appreciation of the RMB to a large extent. Therefore, the RMB appreciated sharply in the past year. The exchange rate appreciated all the way from about 7.00 to about 6.40 at the beginning of this month, during which it appreciated by almost 10%. Such a huge appreciation did not seriously affect the overall situation of China's exports, However, China's export of tungsten products has brought great adverse effects, mainly because China's tungsten products are not necessary for epidemic prevention and control and people's livelihood, the demand in the international market will not increase significantly due to the epidemic, and the demand will be relatively reduced due to the global closure and shrinking production.

Moreover, the demand side of tungsten products is mostly fixed customers, The price of tungsten products implemented by many customers for a long time is relatively stable, so the price of tungsten products has not been fully reflected with the appreciation of RMB,

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and even decreased in some periods. Therefore, the exchange rate factor is difficult to have an upward impact on the price of tungsten products in the short term, but in the long term, the profit of export enterprises has become a large operating cost due to the reduction of exchange loss, it will eventually be reflected in the sales price.



△ Offshore RMB Trend Chart 2021

In the long run, for large head enterprises with capital position ability, foreign exchange hedging ability and flexible use of diversified pricing capabilities such as RMB and euro according to market regions and characteristics, foreign exchange rate fluctuations have little impact on market vitality, but for many surrounding enterprises in the tungsten products industry chain, exchange rate changes, especially RMB appreciation, They have to bear external effects, weaken some of their existing competitiveness, and expose their undetected weaknesses in operation and management.

7. Carbon Neutralization & Carbon Tax

With the promulgation of various carbon emission regulations and the establishment of China's carbon emission exchange, carbon neutralization has gradually come from the concept and entered the real cost of industry and commerce. For high energy consuming industries such as tungsten, molybdenum and rare earth, carbon tax has also become an unavoidable problem. The EU is also planning to introduce carbon tax norms and relevant regulations to the world. Therefore, China's tungsten industry may soon face the problems

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of carbon tax risk and how to shorten the carbon footprint and avoid high carbon tax in Europe and other international markets.



△Carbon Neutralization (the Chinese Word in Carton "碳" is CARBON)

Carbon neutralization is not only an environmental issue, but also a common responsibility of business ethics and mankind. Countries all over the world are gradually converging on this consensus. The gradual implementation of carbon tax will not only push up the consumption price of tungsten products, but also become the cost of production and processing of tungsten products. All production and processing links of tungsten products will be upgraded to reduce carbon emissions and purchase carbon emission rights as much as possible.

China is a big country in water resources utilization, solar energy utilization and new energy development, utilization and production, and China is a big country in tungsten products resources. Over the years, China has accumulated superimposed advantages such as production and processing technology and experience, which may also give us higher production and smelting technology and moral and legal barriers to carbon neutralization in the field of tungsten smelting and processing, it has become one of the advantages of China's tungsten products industry.

The impact of carbon neutralization on the tungsten products industry is one of the important future uncertainties that we need to observe closely.

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8. Sino-US Trade Relationship

The trade disputes between China and the United States, the trade disputes between China and the western countries represented by G7, and the mutual import and export encouragement and restriction measures may also bring uncertainty risks to the future tungsten products market, and then affect the uneconomical fluctuations of tungsten products supply and demand and price in the domestic and foreign markets.



△Game of Sino-US Trade

END OF THE PART I OF VII OF THIS PAPER.
THE 2ND PART OF THIS PAPER WILL ANALYZE THE FACTORE THAT DIRECTLY AND DEEPLY AFFECT THE OF TUGNSTEN PRODUCTS.

(to be continued)

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MARKET & PRICE TREND OF TUNGSTEN

CHINA, 2021

PART II of VII

Processing Cost of Tungsten Products in the Mainland of China

The first part of this paper analyzes the impact of macroeconomic environment related factors on the processing and production of tungsten products. This part further analyzes various cost factors that directly and deeply affect the production and operation links of tungsten product prices, and further analyzes the deep-seated causes of price fluctuations since June and the irreversible impact on the future.



△Price trend of tungsten products in the first half of 2021

The aforementioned macroeconomic and international political environment faced by China's tungsten products industry is complex, and coping with the macro operation and management environment with many uncertainties reflects the flexibility of an enterprise's mechanism and system and the ability of rapid management decision-making; It also reflects the enterprise's deep observation and insight into the tungsten products industry; At the same time, it is also the embodiment of the implementation ability and

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strain mechanism of production, operation and management regulation in all links of operation and management of tungsten products processing enterprises.

On June 27, the monthly report on industrial economic benefits in May released by the National Bureau of statistics showed that in the first five months, the profits of Industrial Enterprises above designated size increased by 83.4% year-on-year, 48.0% over the same period in 2019, and an average increase of 21.7% over the two years.

Zhu Hong, Senior Statistician of the industry department of the National Bureau of statistics, said that the efficiency of industrial enterprises continued to recover steadily in May, but the imbalance of enterprise profits was more prominent and the recovery foundation was not solid. First, affected by factors such as rising commodity prices, the new profits of industrial enterprises are mainly concentrated in the upstream mining and raw material manufacturing industries, and the cost pressure of downstream industries is increasing; Second, the profit growth rate of small and micro enterprises is lower than that of large and medium-sized enterprises, and the profit growth rate of private enterprises is lower than the average level of industries above designated size.

表1 2021年1—5月份规模以上工业企业主要财务指标

分 组	营业收入		营业成本		利润总额	
	1-5月（亿元）	同比增长（%）	1-5月（亿元）	同比增长（%）	1-5月（亿元）	同比增长（%）
总计	481530.0	30.5	401976.0	28.6	34247.4	83.4
其中：采矿业	18660.9	28.4	12695.4	17.1	3008.7	135.5
制造业	426921.7	31.7	357511.0	29.9	29006.6	85.2
电力、热力、燃气及水生产和供应业	[illegible]	[illegible]	[illegible]	[illegible]	2232.1	29.1
其中：国有控股企业	128489.3	29.3	103004.7	25.5	11049.9	150.1
其中：股份制企业	355664.9	31.4	297123.3	29.5	24133.0	86.5
外商及港澳台商投资企业	112287.8	28.8	93373.3	26.9	9394.4	80.8
其中：私营企业	187330.1	31.1	161268.5	30.2	10198.0	56.3

注：
1.经济类型分组之间存在交叉，故各经济类型企业数据之和大于总计。
2.本表部分指标存在总计不等于分项之和情况，是数据四舍五入所致，未作机械调整。

△Main Financial Indicators of Industrial Enterprises Above Designated Size from January to may 2021

According to the annual statistical report of China Tungsten Industry Association in 2020, the absolute profit and profit margin of China's tungsten products industry are far lower than those of Industrial Enterprises above national scale, and a considerable proportion of enterprises are in a state of low profit or loss, which reflects the low technical content of China's Tungsten products industry, large proportion of primary products and poor

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market competitiveness, The low profitability also shows that the production and operation environment of China's tungsten products industry is poor, and it also proves that China's tungsten products industry has not transformed resource advantages into marketing advantages. At least, the production cost of tungsten products is increased, and the sales price is low, which makes the operating profit of tungsten products hover at a low level for a long time.

A rough overview of the cost situation of China's tungsten products industry, we believe that the current main production cost is at a high level for a long time, and the main components can be divided into fixed cost, variable cost, contingent risk and loss, mainly in the following aspects.

1. Mining Cost

Dr. Hanns, CEO of China Tungsten Online and CTIA, who has almost 30 years experiences of processing tungsten products, has previously analyzed and introduced the production cost of tungsten products. All the details of these articles may find at the link at:

"Expert comments on the recent sharp rise in the price of tungsten products"

① http://news.chinatungsten.com/cn/tungsten-product-news/98301-ti-13155.html
② http://news.chinatungsten.com/cn/tungsten-product-news/98368-ti-13170.html
③ http://news.chinatungsten.com/cn/tungsten-product-news/98516-ti-13212.html
④ http://news.chinatungsten.com/cn/tungsten-product-news/98601-ti-13221.html
⑤ http://news.chinatungsten.com/cn/tungsten-product-news/98653-ti-13225.html
⑥ http://news.chinatungsten.com/cn/tungsten-product-news/98690-ti-13430.html
⑦ http://news.chinatungsten.com/cn/tungsten-product-news/98790-ti-13300.html
⑧ http://news.chinatungsten.com/cn/tungsten-product-news/98852-ti-13330.html
⑨ http://news.chinatungsten.com/cn/tungsten-product-news/98866-ti-13335.html
⑩ http://news.chinatungsten.com/cn/tungsten-product-news/98909-ti-13350.html

(We'll translate all these above-mentioned papers into English and list them at the web sites s of China Tungsten Online and CTIA GROUP at http://news.chinatungsten.com & www.ctia.com.cn)

The production cost of tungsten concentrate mainly includes geological exploration investment, mine construction cost, direct production cost of mining (raw ore cost), beneficiation and other links, costs and expenses of safety, environmental protection and other links, as well as operation and management expenses, as well as relevant value-added tax (17%), resource compensation fee (2%), resource tax, land reclamation fee, environmental protection equipment investment Environmental protection operation

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cost and safety cost.



△Tungsten/Wolfram Mining

According to the previous professional research of tungsten products industry, the mining and selection of tungsten concentrate is mineralization, and the basic cost should be RMB 80,000-90,000 per ton. In addition to the rise of various costs in recent years, the current market price of tungsten concentrate is about RMB 100,000, which is also a small profit for mining enterprises.

Nearly 2 million tons of tungsten concentrate have been mined and processed in China's history of tungsten resource mining and processing for more than 100 years. In the early stage, most of the tungsten concentrate mining was to mine the rich and abandon the poor, overexploit for export exchange and short-term interests of enterprises and regions, and did not pay full attention to resource intensive utilization and ecological environment in the mining process, Lack of adequate protection for production safety and human resources. However, in recent years, the mining grade of tungsten concentrate is getting lower and lower, the mining conditions and technical difficulties are becoming greater and greater, the social and national requirements for the production, living environment and quality of industrial personnel are further improved, and the cost of tungsten concentrate and its back-end processing products will gradually increase.

As a strategic resource, tungsten resources have unique performance and expanding applications. Excluding the high prices in small emerging markets such as photovoltaic,

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photoelectric and new energy batteries, the cost of tungsten concentrate directly determines the main raw material cost of a series of traditional tungsten products at the back end, so it has index significance and decisive effect on the market price.



△Tungsten Ore/Concentrate

2. Tax Cost

The tax cost of production link is a legal rigid cost, which has a direct positive correlation with the production output and sales of the enterprise. It is an inevitable expenditure in the process of legal operation of the enterprise.

Before the tax authorities adopted big data and national networking, the tax on the raw and auxiliary materials of tungsten concentrate entering smelting production and processing through various channels may not be paid in full, and there may be some tax loopholes. However, in the era of big data, the electronic system of the tax authorities has accurate judgment on abnormal tax paying enterprises and commodities, which basically eliminates the problem of tax evasion in all links of tungsten products, The original tax payment of mineral products is decentralized and difficult to manage, and the tax cost is gradually balanced and fair, which is finally reflected in the commodity circulation and consumption of tungsten products.

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3. Environmental Protection Cost

Taking CTIA special tungsten oxide supplier and a small tungsten product smelting and processing enterprise as an example, its direct smelting equipment investment is about RMB1.2 million, and the environmental protection cost invested to meet the environmental protection standards is about: environmental impact assessment of no less than RMB 500,000, investment in three waste treatment equipment of more than RMB 2 million, and subsequent equipment operation and maintenance costs, It can be seen that the depreciation of its environmental protection equipment has been twice that of its production equipment.

With the gradual tightening of China's environmental protection policies and the continuous strengthening of implementation, there is no dead corner for the environmental protection pressure of the tungsten products industry. In addition to water, electricity and noise pollution, the recycling and treatment of tungsten slag in the tungsten products industry, especially mining and primary product smelting enterprises, will be a major topic and an urgent problem to be solved, although tungsten slag is no longer listed as hazardous waste discharge, it is also a large cost if it is directly entrusted to a third party for treatment. The cost of solid waste treatment of some tungsten products with complex back-end treatment is about 10000 Yuan; Of course, if the waste tungsten slag can be recycled as the raw material of cement and machine-made brick, the treatment cost will be greatly reduced.



△Tungsten Smelter & Formula Wastewater-Waste Treatment

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Although the implementation of environmental protection policies varies from place to place, the cost of environmental protection is bound to become an unavoidable problem and one of the increasing cost items in the tungsten products industry. We have reason to believe that the recent shortage of some tungsten products in the market or sellers' reluctance to sell is partly due to the restriction or shutdown of smelting enterprises due to the tightening of environmental protection policies and the non-compliance of emission and treatment methods, not the sharp increase and shortage of tungsten products consumption.

4. Safety Cost

The power, gas, steam and other pipelines and equipment used by general tungsten products smelting and processing enterprises, such as power transmission and transformation equipment, pressure pipelines and vessels, have certain potential safety hazards and risks. Therefore, regular maintenance, inspection, inspection and irregular random inspection are a large investment and cost for the enterprise, and it has high safety risks, uncertainties and contingent costs.

Fire hazard prevention, equipment and facilities investment and daily operation and maintenance require professional personnel and set up special posts for disposal, which also increases the safety operation and maintenance cost of the enterprise.

The safety requirements of acid-base and other corrosive liquids, gases and wastes involved in the tungsten products industry for labor safety guarantee have been gradually strengthened after the establishment of a special safety and emergency guarantee department in China, which will be another increasing non productive cost after the tightening of China's tungsten products processing field and environmental protection policies.

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△Traditional Tungsten Mining

5. Replacement Cost

5.1 Depreciation Operation & Maintenance

We know that cash has the problem of cash discount, goods are stored and damaged, machinery, equipment, plants and roads need depreciation, and the depreciation of many items is not only the depreciation of actual value and purchase price. Even if we do not consider the possibility of accelerated depreciation and calculate the depreciation of existing assets as fixed costs, we have to consider the practical problem that the operation and maintenance costs are increasing with the rise of prices and other factors in the process of production and operation.

5.2 Replacement cost

The economic growth of an economy is mainly driven by consumption, whether it is industrial consumption or the consumption of consumer goods for people's livelihood, whether it is domestic consumption or international consumer goods export. The steady and slight rise of prices is an inevitable condition to promote consumption, which has been confirmed by the development process of almost all developed economies. In the decades after China's reform and opening up, prices fluctuated, but the market as a whole was constantly rising, which brought a problem to almost all medium and long-term investment fields and enterprises that the replacement cost increased, even the original

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depreciation could not cover the market price of equipment, and could not replace equipment and expand production, Some enterprises with poor profitability may face the risk of bankruptcy, let alone technology renewal and rapid iterative production.



△Production Cost

From this perspective, if the tungsten products industry realizes a virtuous cycle and its own hematopoietic enhancement, it must consider adding additional capital accumulation and preparation for replacement cost in addition to financial depreciation for the long-term development of the enterprise and from the perspective of the future of updating equipment. If we observe from a higher perspective and think about the industrial structure of production and operation in the field of tungsten products in the environment of 5G + industrial Internet, we should accelerate technical depreciation and make preparations for replacement and even rebirth.

Therefore, from the perspective of accelerated depreciation and technical depreciation, the current cost of tungsten products is far from reflecting the actual cost of equipment depreciation, that is, it does not truly reflect the expected return on capital.

6. Financing Cost

The monetary policy committee of the people's Bank of China recently held a regular meeting in the second quarter of 2021. The meeting analyzed the economic and financial situation at home and abroad, and again stressed the need to implement monetary policy

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flexibly and accurately, promote the further reduction of real loan interest rates, deal with the relationship between economic recovery and risk prevention, and keep the economy running within a reasonable range. The attention to "overall situation" and "stability" in the regular meeting was significantly increased, and the expression was changed in three points compared with the first quarter:

(1) The expression of "strengthening in stability" and "improving in stability" in economic operation was increased, and the attention to "stability" was significantly raised to a higher level; (2) The expression of the economic environment has changed from "significant increase in positive factors of the domestic economy" in the first quarter to "the domestic and foreign environment is still complex and severe", and the expression of the domestic economy has become more pessimistic; (3) The expression of "maintaining the overall stability of the economy and enhancing the resilience of economic development" was added, and the concept of "overall situation" was mentioned for the first time.



△Financing & Accounting

From the changes of the above policies of the central bank, we can know that the current financing difficulties and high financing costs of enterprises are facts, so we will adjust policies, and require commercial banks to start from the overall situation and solve the problem of high financing costs of enterprises, especially the financing difficulties of small, medium and micro enterprises.

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During the epidemic last year, we did get a small amount of bank financing at low interest rates, but it seems that such a policy has not been implemented since this year. I believe that many enterprises in the tungsten products industry, like us, are actually difficult to solve the capital problem at low cost, especially the capital problem required for long-term investment.

The financing difficulty and high financing cost of tungsten products industry have always been the main part of enterprise financial cost. We hope that in the future, the central bank's macro policy requirements can indeed tilt towards the real economy and small, medium and micro enterprises, solve some capital difficulties and reduce some financing costs.

Financing difficulties and high financing costs, especially small, medium-sized and micro enterprises with low-risk resistance, require a large proportion of fixed asset investment on the one hand, and are unable to adjust inventory according to market price fluctuations in order to control raw material costs on the other hand, which also increases operational risks for the production of small and medium-sized enterprises and weakens the self-regulation ability of cost fluctuations.

7. Human Resources & Labor Cost



△Human Resources

Statistics show that in 2020, the average annual wage of Urban Non-private sector employees in China was RMB97,379 Yuan, an increase of RMB6,878 Yuan over the previous year, a nominal increase of 7.6%, and the growth rate was 2.2 percentage points lower than that in 2019. After deducting price factors, the annual average wage of Urban

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Non private sector employees in China will increase by 5.2% in real terms in 2020. Over the same period, the average annual wage of employees in urban private units nationwide was RMB57,727 Yuan, an increase of RMB4,123 Yuan over the previous year, a nominal increase of 7.7%, and the growth rate was 0.4 percentage points lower than that in 2019. After deducting price factors, the annual average wage of urban private sector employees in China will increase by 5.3% in real terms in 2020. It is worth noting that the average wage growth of urban private units in Sichuan, Shanxi and Hunan has reached double digits, 13.5%, 11.2% and 10.5% respectively. Sichuan and Hunan are the provinces with large output of tungsten products in China, which is an important factor affecting the human resource cost of China's tungsten products industry.

Due to the resource distribution of tungsten products in China, many mineral mining and smelting are mostly distributed in remote areas. Therefore, in the current job market, the use of medium and high-end technicians often has to pay high human resource costs. At the same time, due to the particularity of the metal smelting industry, some front-line Posts in production and processing do not need high diplomas, However, in order to attract and maintain the stability of human resources and production technology, many enterprises have to give larger salary increases and competitive wages.

In recent years, when the minimum wage base has been raised to varying degrees every year in all parts of China, the tungsten products industry has to face not only the rising wage, but also the rising labor insurance and welfare expenses such as five insurances and one fund paid with the minimum wage as the legal minimum base; At the same time, all localities have continuously strengthened the construction of trade union grass-roots organizations, and the payment of trade union funds has been gradually standardized and legalized. In turn, trade union funds have become one of the fixed management expenses based on human resources. Therefore, the cost of human resources is one of the rising costs of tungsten products in recent years.

8. Power Cost

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△Wind Power Energy

Power is the main driving force of many tungsten products smelting enterprises, especially for domestic mainstream tungsten products enterprises such as back-end metal smelting and alloy sintering, power cost is one of the main cost items of enterprises. Taking a tungsten smelting enterprise with sufficient coal and electricity in Fujian as an example, due to difficulties in human resource scheduling and night security logistics, an enterprise did not take production measures of peak valley adjustment. Therefore, the gas price is about RMB0.80 Yuan per degree. As a large power consumer, the power cost of a large tungsten product smelting enterprise in the same city is also about RMB0.60 Yuan on average, The mainstream production process from tungsten concentrate to APT also accounts for a large proportion of power costs.

For a long time, China has tried to lower the residential electricity price, and the residential electricity price is significantly lower than the power supply cost. The difference is supplemented by industrial and commercial users in the form of cross subsidies. Compared with most countries in the world, China's industrial and commercial electricity price is high. The national development and Reform Commission recently revealed that "the next step is to improve the residential step price system, gradually alleviate the price cross subsidy, make the power price better reflect the power supply cost, restore the commodity attribute of power, and form a residential price mechanism that more fully reflects the power consumption cost, the relationship between supply and demand and the scarcity of resources."

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In fact, in the whole power consumption, industrial power consumption accounts for nearly 70%, and residential power consumption accounts for only about 14%. Even if the reduction of industrial power cross subsidy will reduce the production and operation costs of high energy consuming enterprises such as tungsten products industry to a certain extent, it can not make up for this loss for power generation enterprises. At present, the cost of new energy in China is higher than that of traditional power generation enterprises, Therefore, if the costs of power generation enterprises are reflected according to the market mechanism and state subsidies are gradually reduced, the power costs such as electric power may not be significantly reduced for the tungsten products industry. With China's high emission industries such as petrochemical, chemical industry, building materials, iron and steel, nonferrous metals, papermaking and aviation gradually incorporated into the national carbon market during the 14th Five Year Plan period, The cost of tungsten products smelting and processing enterprises with high energy consumption may rise to some extent.

In the future, the implementation of carbon tax on carbon emissions, the increase of the proportion of new energy and the demand for electricity by new energy vehicles will become the resistance to the gradual reduction of power cost. Therefore, we can not expect the reduction of power cost in the short term, on the contrary, it may increase to varying degrees.

9. Transportation Cost



△Transportation

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Since June, tungsten products in London, Europe have been in a low inventory state, and the price of tungsten products has increased by 2-3% this month. The main reason is that the vaccine application rate in Europe is generally high and the economy is in a slow recovery state. However, since the epidemic last year, the export volume of epidemic prevention materials and people's livelihood goods in China has increased sharply. Except that the land transportation between China and Europe is normal, the sea and air transportation capacity is very tight, the transportation cost has risen sharply and one container is hard to find. The freight price between China and Europe has almost quadrupled. Therefore, the deformity of the global supply chain, the imbalance between East and West logistics, and the abnormal blockage of the Suez Canal have cut off the main channels between China and Europe for a period of time, so that a large number of goods to be exported are piled up in the ports, A large number of empty containers in Europe and America cannot be transported back for normal circulation. In this case, the freight of tungsten products is rising all the way. At the same time, due to the large weight and high amount of tungsten products, there is no bargaining power in freight and premium, which leads to the high cost of terminal consumption of tungsten products.

The crowding out effect of tight shipping capacity makes a large number of goods in urgent need of documents catch up with air transportation, and even many tungsten products have to take the "luxury journey" of express line for delivery. As a result, the freight included in the overall delivery cost of tungsten products has increased significantly, and the price in the overseas market has increased accordingly.

Moreover, tungsten products, especially tungsten oxide products and metal tungsten powder products, are generally regarded as dangerous goods and transported as dangerous goods, resulting in a much higher freight premium than ordinary goods. According to the experience of China Tungsten online, since 2020, the overall export freight has increased by more than 50%, and there is no sign of mitigation at present.

The same is true for domestic transportation. Due to the increase of fuel cost and the sharp increase of online shopping due to the epidemic, the domestic transportation capacity is also squeezed, resulting in a sharp increase in the transportation channels, railway express, road transportation and express delivery of various tungsten products.

Therefore, the transportation cost is one of the external costs beyond the control of both the buyer and the seller in the short term, and increases with the mitigation of the epidemic, the rise of oil prices and the recovery of the global economy.

Based on the above incomplete analysis of various production and operating costs of

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tungsten products, it is not difficult to find that the recent rise in the price of tungsten products is not accidental and will not fall sharply in the long run. Under the environment of US dollar drainage and inflation global output, the prices of raw and auxiliary materials, labor and power for the production and processing of tungsten products are rising, and the price of tungsten products has entered the rising channel; The duration, fluctuation and increase of the rise depend on the speed of global economic recovery and the game between supply and demand of tungsten products market.

END OF THE PART II OF VII OF THIS PAPER.
THE 3ND PART OF THIS PAPER WILL ANALYZE THE SPILLOVER EFFECT, OPPORTUNITIES & RISKS OF TUGNSTEN PRODUCTS IN THE FUTURE.

(to be continued)

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MARKET & PRICE TREND OF TUNGSTEN

CHINA, 2021

PART III of VII

Problems, Risks of Tungsten Industry of China

The first and second parts of this paper analyze the macroeconomic environment impact of tungsten product processing and production, the reasonable factors of tungsten product cost rise and the market reasons based on economic rationality. This part further analyzes the possible spillover effect of the sharp rise in the price of tungsten products, and the problems and risks faced by the tungsten products industry chain, especially small and medium-sized enterprises.

1. Price Outlook of Tungsten Products

1.1 Short- & Medium-Term Trend Forecast of Tungsten Product Price

Based on market supply and demand, prices of relevant raw and auxiliary materials and peripheral products, macroeconomic data and psychological expectations of the buyer and the seller, China Tungsten online began to predict that the price of tungsten products will face a price rise process last Monday. It is expected that the quotation of main tungsten products last week will rise by 3-5%. Tungsten concentrate is more than RMB100,000 Yuan per ton, while APT is more than RMB150,000 Yuan per ton, The price of medium particle tungsten powder will be more than RMB233 Yuan per kilogram. As of this week, the actual transaction price of tungsten products market confirmed the accuracy of this questionable forecast.

Looking at the overall price trend of tungsten products in history and its relationship with macro economy (GDP), our analysis shows that unless there is the sudden impact of the black swan incident, the price of tungsten products will rise gradually in a short term, reaching a high point after an overall increase of 20% from the end of 2021 to the beginning of 2022; In the medium and long term, the price of tungsten products shows a rising trend of fluctuation curve. From the end of the 14th five-year plan to the beginning of the 15th five-year plan, it is generally about 40%, which is in line with the overall economic development and relatively reasonable.

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△Price Trend of China's Tungsten Products in the First Half of 2021

In the short term of 2021, according to the above analysis, the rate of international vaccine implementation has gradually increased, countries have begun to unseal, the United States, Japan and South Korea and other regions have gradually implemented the 14-day quarantine restriction of the contact vaccine workers, and COVID-19 will gradually become influenza, which will gradually reduce the impact on the world economy. The world economy will gradually change from China's dominance to a comprehensive recovery and overall growth. At the same time, the excessive currency issued by western countries led by the United States due to the epidemic will inevitably be transmitted to the Chinese market in the form of imported inflation in the future. Therefore, macroeconomic factors will play a long-term role in supporting the price of Chinese tungsten products with an absolutely dominant position, this has been reflected in the prices of other metals.

As the raw materials of small metals such as molybdenum, tin and cobalt, the price of tin ingots has increased significantly since 2021: the price of tin ingots has risen from RMB150,000/MT to about 200,000/MT; Molybdenum ore also rose from RMB1,500/MT degree to more than 2,000/MT degree in 2021. Although it has been slightly adjusted at present, its prices have increased by 30% - 40% simultaneously with bulk metal raw materials. The price of tungsten products, which has been low for a long time, has only increased slightly by about 15%, which not only does not reflect the scarcity and irreplaceable of tungsten products, there is no reasonable transmission and response to the rising real cost of other products. Based on this, we judge that tungsten products still have an average rise of about 10% without a significant correction in the economy and the

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Fed's short-term interest rate policy unchanged.

In the medium and long term, we believe that China's economy will continue to grow steadily and rapidly, the manufacturing industry will gradually develop to intelligent manufacturing and high-end industries, the economic volume will become larger and larger, and the proportion in the overall volume of the world economy will become higher and higher; At the same time, with the increase of national income, the domestic consumer market still has a lot of room to rise, and China's manufacturing industry will still be in the growth period of domestic and foreign demand for a long time. In the growing macroeconomic environment, China's manufacturing industry will also grow rapidly. On the basis of traditional industries, the demand for all kinds of tungsten products will also benefit from the demand of emerging industries. In the long run, tungsten products, as an indispensable tool product for industrial enterprises, will also grow simultaneously, the offsetting effect of the gradually withdrawn industry and recycled tungsten products on the market will not have a significant impact on the price of tungsten products. Therefore, we speculate that at the end of the 14th Five Year Plan period, China's tungsten products are promising for a long time and are expected to increase by 25-30%.



△Price Tend Chart of China's Tungsten Products During the 13th Five Year Plan Period

1.2 Spillover Effect of Price Rise of Tungsten Products

According to the experience in the past decades and the current industrial situation, it is not difficult for us to draw the following conclusions. If the price of tungsten products is

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too high, several market spillover effects may occur:

(A) Profitable imported ore may become a balancing factor in the domestic tungsten concentrate market. At the same time, it also has a great incentive for domestic market participants with mining and primary smelting capacity and technology to go abroad to find ore and mine, which affects the domestic mining, production and processing capacity.

(B) The import, recycling and processing of tungsten wastes have become profitable businesses, so that the recycled materials that can be mass produced by zinc melting method can expand the market share, thus affecting the raw ore market of tungsten concentrate and reducing the price of raw materials of tungsten products.

(C) Taking a domestic tungsten molybdenum companion ore as an example, if the price of tungsten products continues to be high, it will gradually increase the mining and separation capacity of some associated ores containing scheelite and low-grade black-and-white tungsten ores, so as to get a share in the tungsten products market.



△Tungsten Mining

(D) At present, many ceramic materials, graphene and their derivatives have shown their substitutability for cemented carbide in the field of tool application. If the price of cemented carbide is gradually pushed up, it is believed that the substitutes of tools will have a certain inhibitory effect on the tungsten product market.

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(E) A large number of inventories such as APT left by Pan Asian nonferrous metals exchange that have not been digested by the market may also be put into the market due to the sharp rise in the price of tungsten products, which will have a great impact on the market supply.

(F) in the middle and late June, the national development and Reform Commission and the State Administration of market supervision successively sent joint working groups and research groups to investigate the supply and price stability of coal market, iron ore spot market and urea market. At the same time, the national development and Reform Commission and other departments frequently made efforts to curb the unreasonable rise of commodity prices, Recently, the State Food and materials reserve bureau also announced that it would organize the release of national reserves of copper, aluminum and zinc. After the implementation of relevant measures, from the perspective of the purchase price index of main raw materials, in addition to the continued rise of petroleum, coal and other fuel processing industries, other industries fell significantly, and the rapid rise of manufacturing prices was initially curbed. The purchase price index and ex factory price index of main raw materials changed from increase to decrease this month, which were 61.2% and 51.4% respectively, 11.6 and 9.2 percentage points lower than that of the previous month. Therefore, we can expect that the state's policy to curb the rise in prices in the short term is firm and timely. If the price of tungsten products rises too much in the short term, or there are obvious non market rational operations, the State Food and materials reserve bureau will certainly put in tungsten concentrate inventory in time to increase market supply and stabilize the market price of tungsten products.

2. Problems Faced by Tungsten Industry

Statistics show that in the first half of 2021, China's original excess capacity of tungsten products has been released to a certain extent, especially the mainstream intermediate products. In the first half of 2021, the volume increased significantly, with a year-on-year increase of more than 40%, and the total volume reached nearly 70000 tons. According to the statistical data of China Tungsten Association, the total output of tungsten concentrate in China in 2020 is less than 140000 tons, of which 90% of tungsten concentrate is consumed by APT production, which highlights the serious overcapacity of APT in China. According to China Tungsten online statistics, the existing capacity of APT in China is no less than 200000 tons, while only about 50% are actually produced after commencement, which confirms the tight supply of tungsten concentrate market, Firstly, the price is high, while the back-end APT price is relatively low, which is due to the tight supply of tungsten concentrate last week (late June 2021).

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△Tungsten Concentrate

The main consumer of APT，the end tungsten powder and subsequent product tungsten carbide powder in the first half of 2021, the output of tungsten powder increased by more than 30% year-on-year. The situation of ferrotungsten is also similar to APT, and the total production volume also reached about 5000 tons due to the high economic demand of the iron and steel industry. Due to the overcapacity of intermediate products, China's tungsten products industry has been in the buyer's market with excessive supply for a long time, and the price is difficult to increase significantly. Similarly, the processing fee of intermediate products, such as APT, also hovers below 20000, making it difficult to make profits, while the newly invested intermediate smelting enterprises that meet various specifications such as environmental protection are on the verge of loss.

It can be seen that the current overcapacity and output of China's tungsten products industry is the reason why tungsten products have been in a downturn for a long time in the past few years. Although China's GDP has continued to grow at a high speed, the price of tungsten products is much lower than that in 2011-2014, and it is also the reason why the current price of tungsten products has not increased significantly in 2021 The sharp rise in the prices of various commodities did not rise with the boom index.

3. Problems Faced by Tungsten Market

3.1 Impact of Manufacturing Boom

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Since 2021, COVID-19 has been increasing rapidly in the first half of the year, but the economic performance of the second half of this year will be affected by the rapid spread and prevention of the new crown pneumonia delta virus, especially in the(a) recovery of foreign markets. There is a great uncertainty in the 1. (b) Recovery and continuity of the domestic consumer market; (c) The main manufacturing indexes show a downward trend, and the future trend remains to be determined by the comprehensive effect of complex factors at home and abroad.



△Trend Chart of China's Manufacturing PMI Index

Recently, the prices of some bulk commodities such as iron and steel, copper, aluminum, lead and zinc have risen sharply, which obviously deviates from the fundamentals of supply and demand and exceeds the reasonable range of restorative rise affected by the epidemic. The national development and Reform Commission, the State Administration of market supervision and other departments have frequently sent joint working groups and research groups to investigate the coal market, iron ore spot market In this case, the National Bureau of statistics released data on June 30, which showed that China's Manufacturing Purchasing Manager Index (PMI) was 50.9% in the first half of the year, slightly down 0.1% from the previous month, and continued to be above the critical point, but the high price index fell, The rapid rise in manufacturing prices has been initially curbed. The purchase price index and ex factory price index of main raw materials in this month changed from increase to decrease, 61.2% and 51.4% respectively, 11.6 and 9.2 percentage points lower than that in the previous month. Except that the petroleum, coal and other fuel processing industry is still higher than 70.0% and the ex-factory price of

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products continues to rise, the ferrous metal smelting and rolling processing industry, nonferrous metal smelting and rolling processing industry have decreased significantly, all fell to the contraction range.

3.2 Market Drivers of Electricity Price Increase



△Power Supply, EHV Transmission & Transformation Line

Since the reform and opening up, especially since China's entry into WTO, China's manufacturing industry has catch up from behind, and has been the most important place in many fields. Last year, COVID-19's strength in manufacturing industry was strengthened. This is mainly due to the fact that China's large-scale power generation and transmission and transformation enterprises are basically state-owned enterprises, which have implemented the national cross subsidy policy of separate pricing of residential and commercial electricity for a long time, but whether this policy can be implemented for a long time is unknown. In addition to the low cost of China's large-scale hydropower generation, China's new energy the proportion of clean energy, such as photovoltaic, wind energy and natural gas, will be higher and higher. This kind of energy is not basic electricity, and the cost is relatively high. In order to complement traditional energy and make long-term profits and sound development of power enterprises, it may be necessary to increase the price of industrial and commercial electricity when it is inconvenient for residents to significantly increase the price of electricity, This can not only further promote the marketization of the power industry and more truly reflect the costs and interests of all parties, but also promote residents and enterprises to save and reduce and

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control energy consumption under the condition of high electricity price.

If the electricity price increases in the future, it can be predicted that most of it will be borne by industry and commerce, because in the game among power enterprises, residents and industrial and commercial users, power supply enterprises need to obtain income and the basis for sustainable development in the future through full marketization; The rise of civil electricity price involves all aspects of society and non market factors such as social stability; Therefore, industrial and commercial enterprises will eventually become the main bearers of power prices under the principles of market fair trade and social responsibility.

The tungsten molybdenum products industry, which takes electricity as the basic power and important cost, will inevitably have too high production cost due to the rise of electricity price, which will be reflected in the final product price.

3.3 Deceleration of Domestic Track Construction

Referring to the relevant network news, the relevant standard requirements for applying for subway cities in the opinions on Further Strengthening the planning and construction management of urban rail transit (Draft) issued by the national development and Reform Commission are as follows: the general public budget revenue is more than 30 billion Yuan, the regional GDP is more than RMB 300 billion Yuan, and the urban permanent population is more than 3 million people. The requirements for GDP and fiscal revenue are three times that of 15 years ago, and the financial contribution proportion of urban rail transit projects in cities with government debt ratio of more than 100% and 120% in the previous year shall not be less than 60% and 80% respectively; For cities with a government debt ratio of more than 150%, the provincial development and reform department shall not approve new construction projects. In addition, the draft also makes new requirements for the application for the construction of light rail cities: the general public budget revenue is more than 15 billion Yuan, the regional GDP is more than 150 billion Yuan, and the urban permanent population is more than 1.5 million. The draft also proposes that the initial passenger transport intensity of the proposed subway and light rail lines should not be less than 7000 person times and 4000 person times per kilometer per day respectively. The long-term passenger flow scale shall reach 30000 people and more than 10000 people in one-way peak hours respectively.

Therefore, we do not know the current progress of track projects in Yantai, Nanning, Hohhot, Baotou, Kunming, Xi'an, Lanzhou, Shenyang, Harbin, Guiyang and Urumqi, However, at least we can conclude that the state has more rational management ideas and scientific planning for the urgency of track construction, the financial affordability of local

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governments and the actual transport capacity. Therefore, the strict management of track projects that consume a lot of cemented carbide products and the gradual reduction of new project investment are bound to have a negative impact on the overall consumption of tungsten products.



△Rail Transit

3.4 Subversion of New Energy Vehicles to the Automotive Industry

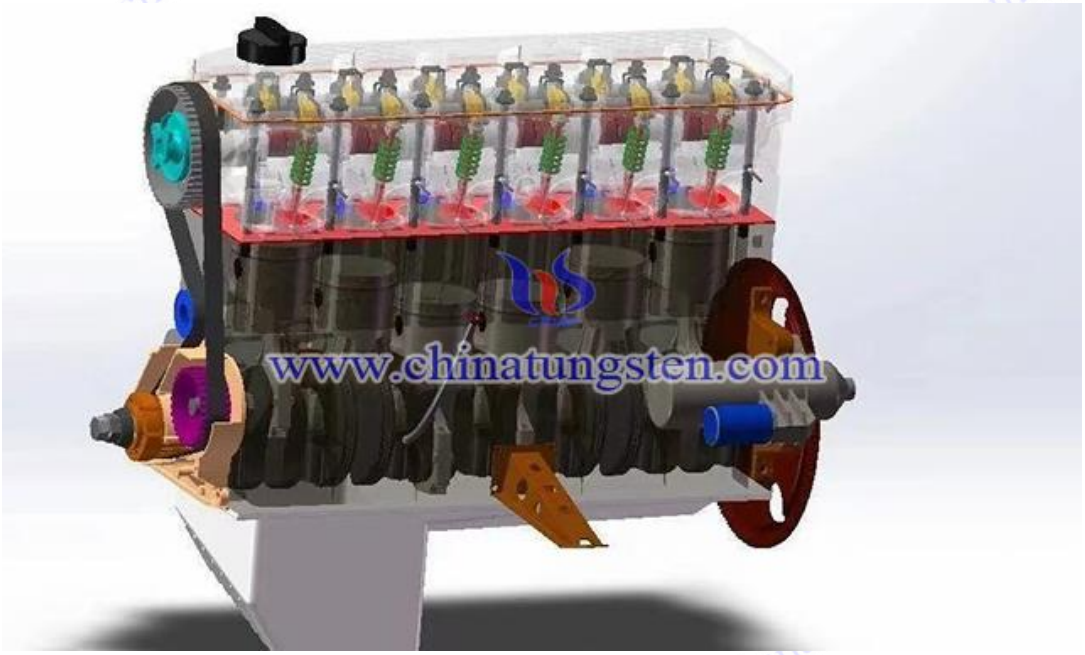
Like 3C products, traditional fuel vehicles consume a large number of cemented carbides cutting tools, which has driven the consumption of steel and tungsten products for a long time. However, due to increasingly strict emission requirements and more and more regulated vehicle emissions, various countries have set carbon neutralization targets for this century, giving birth to the development and application of new energy, Traditional fuel vehicles, the main force of mass energy consumption, have become the target of public criticism. Their substitutes, new energy vehicles, have experienced a blowout growth in recent years, not only the rapid rise of Tesla and Xiaopeng's new energy vehicle brands, but also the continuous introduction of their own new energy models by traditional automobile manufacturers, Moreover, Audi and other manufacturers have made clear the timetable for stopping the sale of traditional fuel vehicles.

The biggest difference between traditional fuel vehicles and energy vehicles lies in their different power supply methods and transmission devices. Manufacturing these engines and transmission devices requires a lot of complex machining, which is one of the reasons

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why traditional vehicles need a lot of cemented carbide tools and consume tungsten carbide powder, new energy vehicles greatly simplify the fuel transmission drive mode, thus reducing the demand for cemented carbide tools. Therefore, in the foreseeable future, with the continuous technological progress of new energy vehicles and the popularity of AI automatic driving software and charging piles, fuel vehicles will soon withdraw from the historical stage, and the cemented carbide tool industry will also face a huge challenge



△As Long as We Look at the Complexity of the Main Body of BMW Engine, We Can See How Much the Battery Power of New Energy Vehicles has been Reduced

3.5 Competition Among Graphene, Cermets & High Entropy Alloys

(A) Graphene

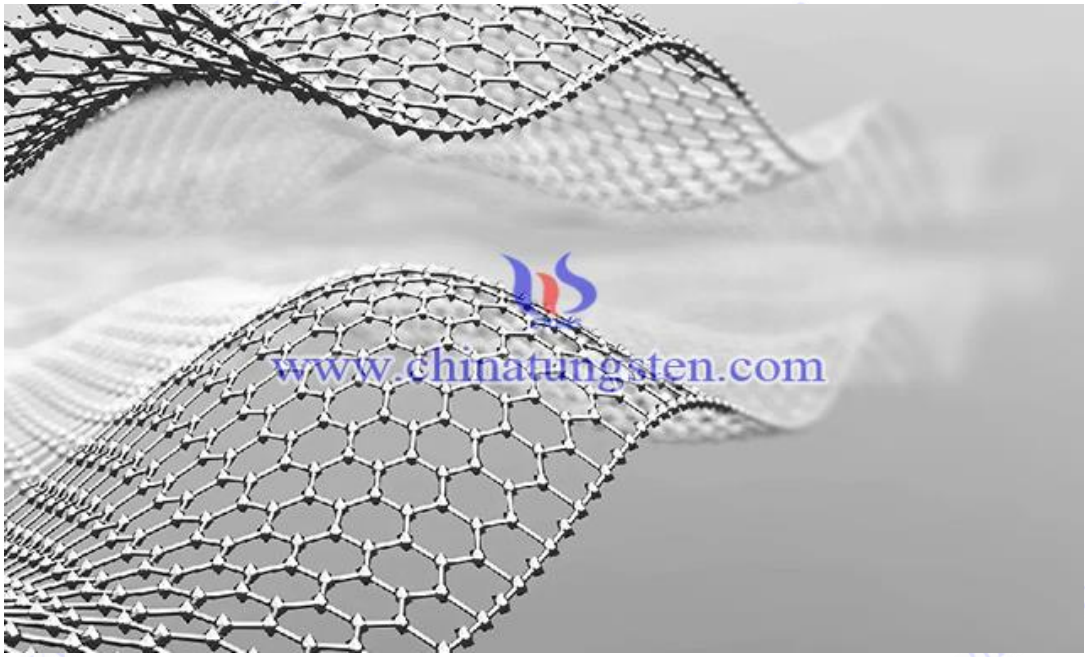
With the gradual breakthrough of mass production and large-scale problems, as a new material with hybrid connected carbon atoms tightly stacked into a single-layer two-dimensional honeycomb lattice structure, graphene has excellent optical, electrical and mechanical properties, and has important application prospects in materials science, micro nano processing, energy, biomedicine and drug delivery, The main applications with strong competitiveness with all kinds of tungsten products are known research achievements such as new energy batteries, hydrogen storage materials, aerospace, photosensitive elements, composites and so on.

Graphene new energy cells and hydrogen storage materials will replace the application of

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nano tungsten oxide in new energy cells, which has not been widely promoted and market applied at present. In particular, the flexible photovoltaic panels with graphene nano coating can greatly reduce the cost of manufacturing transparent and deformable solar cells, this has a great impact on the application of tungsten oxide in photovoltaic field; Graphene composites are an important research direction in the application field of graphene. In addition to their excellent properties in the fields of energy storage, liquid crystal devices, electronic devices, biomaterials, sensing materials and catalyst carriers, the research of graphene composites mainly focuses on graphene polymer composites and graphene based inorganic nano composites, Many special properties of graphene reinforced bulk metal matrix composites, graphene made multifunctional polymer composites and high-strength porous ceramics make graphene have broad application prospects in replacing tungsten based materials.



△Graphene Products

(B) Metal Cermets

Cermets, which is composed of one or more ceramics and metals or their alloys, is a heterogeneous composite material. It has the toughness and bending resistance of metals and ceramics, and the latter has some advantages such as high temperature resistance, high strength and oxidation resistance. Cemented carbide itself is a kind of cermets. The meaning of cemented carbide itself in English translation has the meaning of ceramics. Metal based cermets are prepared by adding fine oxide powder into the metal matrix, also known as dispersion reinforced materials, mainly including sintered aluminum (aluminum

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alumina), sintered beryllium (beryllium beryllium oxide), TD nickel (nickel thorium oxide), etc. in a broad sense, cermets also include refractory compound alloy, cemented carbide and metal bonded diamond tool materials.



△Cemented Carbide Processing

It has the characteristics of high temperature resistance, high temperature strength, high hardness, good thermal conductivity, high mechanical strength, chemical corrosion resistance, high wear resistance, thermal vibration resistance and good high temperature creep. It has strong substitutability for cemented carbide. This kind of cermets mainly include cermets based on oxides such as alumina, zirconia, magnesium oxide and beryllium oxide; Cermets based on titanium carbide, silicon carbide and tungsten carbide; Nitride based cermets based on titanium nitride, boron nitride, silicon nitride and tantalum nitride; Boride based cermets based on titanium boride, tantalum boride, vanadium boride, chromium boride, zirconium boride, tungsten boride, molybdenum boride, niobium boride and hafnium boride; Silicide based cermets based on manganese silicide, iron silicide, cobalt silicide, nickel silicide, titanium silicide, zirconium silicide, niobium silicide, vanadium silicide, niobium silicide, tantalum silicide, molybdenum silicide, tungsten silicide, barium silicide, etc.

Different from tungsten-based alloys, metals cermet generally has much more excellent characteristics such as low density and easy processing, and have more extensive application and important role in some special fields. Therefore, the impact of cermets on various products of tungsten in the future can not be ignored.

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(C) High Entropy Alloys (HEA)

Alloys formed by five or more equal or approximately equal amounts of metals also become multicomponent high entropy alloys and high entropy alloys, also known as high disorder alloys. Entropy is a thermodynamic disorder parameter. The higher the disorder, the higher the entropy. The entropy of a single major element of the alloy is generally between 0-0.69, while the entropy of more than five major element alloys is greater than 1.61, Therefore, it is called high entropy alloy. Its metal elements are between $5 \leq n \leq 13$, and the percentage of each main element is generally no more than 35%. There are about 30 kinds of multi principal component alloys with 5 ~ 13 Yuan in traditional alloys; The combination of 13 elements from 80 metals into 5-element, 6-element, 7-element... And even 13 element alloy series will expand the saturated traditional single principal component alloy to 7099 multi principal component alloy products, which is a brand-new alloy world. Since the concept of high entropy alloy was put forward in 1995, the research and development achievements of various countries have been surging, with high temperature thermal stability, corrosion resistance, high strength High hardness, high oxidation resistance and excellent magnetoelectric properties make it a new material with great development potential.

Tungsten alloy, whether two-phase alloy, three-phase alloy, high specific gravity alloy or cemented carbide, belongs to traditional alloy products. It is generally produced and processed in the form of tungsten cobalt, tungsten nickel, tungsten nickel iron, tungsten nickel copper, tungsten silver and tungsten copper. Even if Titan and other rare earth elements are added, it can not be regarded as high entropy alloy because the percentage of single element of tungsten is much higher than 35%. High entropy alloy elements are modified with equal or non equal molar ratio and added trace elements, such as NiCoFeCrSiAlTi, MoTiVFeNiZrCoCrPd, CuCo0.5Ni1.2CrAlFe1.5, or CuCo0.5Ni1.2CrAlFe1.5B0.1C0.15. The performance is greatly improved.

Many intermetallic compounds formed between traditional binary or multicomponent alloys will disappear under high entropy effect, The strength of high entropy alloy is better than that of traditional alloy. The fracture resistance, tensile strength, corrosion resistance and oxidation resistance are better than those of traditional alloy. The performance of nano high entropy alloy is better, which makes it have broader application fields and promotion space. It also has the ability to replace hard alloy and other tungsten products in wear resistance, stamping die, cutting tool, hard surface material, corrosion resistant material Photovoltaic and many other fields have more space. The booming research and application of high entropy alloy is bound to bring great impact to traditional tungsten alloy products.

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△Tungsten Metal & Heavy Alloy Cubes

3.6 Cost of Industrial Norms & Standards Risks

(A) Data Leakage Risk

The current common sense makes us understand that even digital giants such as Microsoft, Google, Facebook and Amazon are difficult to resist the endless data requirements from the U.S. government on the grounds of national homeland security. The U.S. government is even interested in "who to talk to" and "what to say". We can imagine, the detailed data of China's tungsten products enterprises obtained by RBA in the United States must be of interest to many U.S. government departments and commercial competitors, and its risk may be far from just commercial competition. When Didi travel was listed in the United States, it was reviewed by the national network information office in accordance with the national security law of the people's Republic of China, the network security law of the people's Republic of China and the measures for network security review. This shows the seriousness and harm of China's enterprise data leakage, and also shows the country's attention to enterprise data security.

(B) Meng Wanzhou's Judicial Problems

Meng Wanzhou, Huawei's CFO detained for a long time, has not been resolved yet. I believe most people in the world know that the reason is only because of Huawei's technology and China's industrial leadership, rather than the so-called Iran. Therefore, China's tungsten

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products enterprises should clearly realize that in the future, they may also be funded by their own money The data and materials issued by the "responsible" organization make their export goods detained, and even enterprises and managers face Meng Wanzhou style judicial problems.

(C) Additional Cost Burden

All enterprises are the same, and tungsten products processing enterprises are no exception. They are faced with more and more various, including government agencies, civil society, industry associations, domestic and international, various qualifications, inspection fees, inspection fees, annual fees, service fees, membership fees, conference fees, certificate fees, information fees, etc. In recent years, for many nephews and inspectors in the west, if the non production and operation expenses such as due diligence, factory inspection, submission of reports and annual review become higher and higher, it may be a drop in the bucket for large enterprises, but it is not a small burden for many small and medium-sized enterprises in China, and it is also a frost on the snow. We have to say to some extent that most tungsten products are originated in China, which has the final say that China imports little tungsten raw materials, even if imports are basically from Vietnam, is a well-known fact. But at present, it is necessary for an organization in the United States to make the final decision.

3.7 Carbon Footprint & Carbon Tax

In recent years, in the face of China's advantages in tungsten, molybdenum, rare earth and other industries and the carbon tax continuously launched to achieve the goal of carbon neutralization, the carbon footprint of China's tungsten products in the global market has no environmental protection advantages compared with the key materials such as tungsten, molybdenum, rare earth independently developed in Europe and America in recent years. In addition, the West's concern that new energy and other industries are increasingly dependent on China's industry, so it is estimated that China's tungsten products have no environmental protection advantages the industry will face the hidden worry of high carbon tax.

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△New Energy Vehicles (EVs)

3.8 Anti Dumping

In 1990, the EU began to impose 33% anti-dumping duty on tungsten carbide in China. On December 30, 2009, the EU again launched a sunset review on the case and decided to continue the measure on March 24, 2011. In June 2013, the EU made the final decision of the sunset review on the anti-dumping of tungsten electrodes originating in China and continued to impose a general anti-dumping duty of 63.5% on the products involved imported from China. Previously, it was also the case It is rumored that the relevant industries in the United States have also put forward anti-dumping calls for China's tungsten products. Therefore, for their own interests, Europe and the United States, under the condition of ensuring the smooth import of tungsten intermediate products from China, take anti-dumping measures to levy anti-dumping duties on relevant products in an unfavorable competitive position, so as to curb the export competitive advantage of China's tungsten products, which means that any tungsten products in China Products with competitive advantages in the product industry may face the risk of anti-dumping sanctions in the future.

4. Problems, Difficulties of Small & Medium-sized Tungsten Enterprises

China's tungsten products industry has high overall production capacity, even some products are in surplus, and there is a lack of high-end products. Among them, the difficulties faced by small and medium-sized micro tungsten products enterprises are particularly serious.

(a) Tungsten is a specific mineral for protective mining stipulated by the State Council. Mining requires mining licenses and quotas. Small and medium-sized enterprises are short of funds and do not have the technical strength to control and mine tungsten concentrate resources. Except for large tungsten products enterprises such as China

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Minmetals, Xiamen Tungsten, Jiangxi Tungsten Group, Zhangyuan Tungsten and Rising Nonferrous Metals, it is difficult for other enterprises to obtain new large mining and mining qualifications.

(b) In view of China's mining rights and total mining volume control system, China's tungsten concentrate is prohibited from export, and tungsten intermediate products also belong to export quota control products. In addition to more than a dozen large tungsten products enterprises successively winning export quotas, small and medium-sized enterprises have little possibility of obtaining export quotas; at the same time, some tungsten products belong to dual-use products, and most of them need to be controlled Export controls.

(c) Due to the inherent financial disadvantages of small and medium-sized tungsten products enterprises, they are constrained and difficult in technology R & D, quality control, product marketing and so on. It is mainly reflected in the poor ability of equipment investment, renewal and replacement, especially the poor technical content and ability of testing equipment and facilities, which leads to low asset quality, low production efficiency, limited production capacity and so on A series of problems; and the more serious consequence of the problems of self owned funds and financing is that it is difficult for small and medium-sized tungsten products enterprises to leave a large self-protection buffer zone in the market with large economic fluctuations and large price rise and fall.

(d) The safety and environmental protection requirements are becoming higher and higher. Due to the small production scale, many small tungsten mines are short of investment to meet the environmental protection requirements, or they simply can not bear the standardized safety and environmental protection investment, they are bound to be closed one after another, and the output of tungsten concentrate will be affected to a certain extent.

(e) Various qualification requirements and procedures, processes, documents and other red tape have high requirements for enterprises, and many qualifications are difficult to obtain, such as ISO9001, ISO1400 and other certification. The direct consequence is that it is difficult to meet the basic qualifications in the face of bidding of large enterprises, such as CGN, AVIC large aircraft, China Railway and so on.

(f) Human resources are the most important asset of an enterprise. The quality and stability of human resources determine the survival of an enterprise. However, due to the limitations of capital and natural geographical conditions, such as low average salary, relatively remote region, narrow position and salary rise space and other unfavorable

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factors, it is not attractive to excellent technical and management talents. Due to the weak financial strength and profitability Human resource disadvantage may be the last straw to overwhelm private enterprises under the situation of sharp fluctuations in supply and demand and price of tungsten products market!

END OF THE PART III OF VII OF THIS PAPER.
THE 4TH PART OF THIS PAPER, THE AUTHOR WILL MAKE A SUPERFICIAL ANALYSIS ON THE FUTURE OF CHINA'S TUNGSTEN INDUSTRY, POSSIBLE OUTLETS &THE BREAKTHROUGH WAYS OF SMALL & MEDIUM-SIZE ENTERPRISES.

(to be continued)

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MARKET & PRICE TREND OF TUNGSTEN

CHINA, 2021

PART IV of VII

Challenge, Opportunity & Tuyere of Tungsten Enterprises

The first part of this paper analyzes the impact of macroeconomic environment factors on the processing and production of tungsten products. The second part further analyzes various cost factors that directly and deeply affect the production and operation links of tungsten product prices, and reveals the deep-seated causes of price fluctuations since June and the irreversible impact on the future. The third part analyzes the spillover effect of tungsten product price rise in the fourth part, CTIA attempts to make a superficial analysis on the future opportunities, possible outlets and breakthrough ways of small and medium-sized enterprises of China's tungsten industry.

Although the tungsten products industry is facing the impact and challenges of the macroeconomic environment at home and abroad, the fierce competition in the industry and the competition of emerging industries and products outside the industry against the existing market; At the same time, China's tungsten industry is also facing opportunities and serious challenges from network economy, digital technology and intelligent manufacturing. Therefore, we should recognize the current industrial macro political and economic environment, meso industrial policies and industrial status, micro industry development and fierce competition, and formulate appropriate development strategies and technical and tactical plans, adjusting measures to local conditions and doing a good job in the production, operation and management of enterprises is an essential way of development and survival.

With new economy, new energy and new infrastructure as the main tone, China's rapid economic development and manufacturing advantages have been further confirmed and strengthened since the outbreak of the epidemic and the severe situation of prevention and control in 2020. China's tungsten industry is also facing the opportunities and challenges of transformation and upgrading in the process of new energy and new infrastructure, Facing the new demand increment of tungsten products industry and the opportunity of product transformation in the process of transformation and upgrading of new economic business forms.

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△Tungsten Oxides & Trioxides

1. New Energy Technology Innovation

New energy (NE), also known as unconventional energy, refers to various forms of energy other than traditional energy (widely used conventional energy such as coal, oil, natural gas and hydropower). The United Nations "United Nations Conference on new and renewable energy" in 1980 The definition of new energy is to modernize the development and utilization of traditional renewable energy based on new technologies and materials, and replace fossil energy with inexhaustible and recurring renewable energy with limited resources and polluting the environment. New energy generally refers to renewable energy developed and utilized on the basis of new technologies, including solar energy, biomass energy and wind energy, geothermal energy, wave energy, ocean current energy and tidal energy, as well as the thermal cycle between the ocean surface and deep layer; in addition, it also includes hydrogen energy, biogas, alcohol, methanol, etc. The International Energy Agency recently released the 2020 energy technology outlook report After in-depth analysis of more than 800 emission reduction technologies, based on the calculation of facility transformation and consumer behavior transformation, the global power consumption will be 2.5 times that of the current by 2050. In order to meet the new power demand in the future, the average annual new installed capacity of global renewable energy needs to reach 700gw within 30 years, four times that of 2019.

At present, the key fields of new energy development in the industry are solar energy, wind energy, biomass energy, tidal energy, geothermal energy, hydrogen energy and

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nuclear energy (atomic energy), with the limitation of conventional energy and the increasingly prominent environmental problems, new energy characterized by environmental protection and renewability has attracted more and more attention from all countries. The awareness of new energy industry in global environmental protection has been enhanced, and carbon neutralization and carbon tax measures have been gradually implemented and implemented more and more strictly. Therefore, new energy will become a new outlet for China's tungsten products industry, which will make China's tungsten products The industry faces two opportunities.



△New Energy Instruments

1.1 Development of New Energy Industry

In the process of large-scale development and production of new energy industry, a large number of cemented carbide products such as mining tools, cutting tools and tool molds will be consumed. This is a new blue ocean outside the traditional application field of cemented carbide products, which will greatly improve the consumption of cemented carbide products with the development of new energy. During this period, it will inevitably pose new challenges to cemented carbide production and promote relevant enterprises at the same time, the special glass, mechanical parts, seals and other products of the new energy industry will greatly increase the demand for facilities and equipment such as metal tungsten heating components, boats and containers, as well as electrical and electrical facilities and heat conducting parts such as tungsten alloy and tungsten copper alloy.

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1.2 Application of New Energy Industry

The application field of new energy industry involves a large number of solar energy collection panels. In the process of technological upgrading to continuously improve solar energy utilization efficiency, tungsten compound products are increasingly used in various solar glass production and glass coating. At the same time, there will be a great market space in the field of agricultural greenhouses, smart glass coating and other solar energy utilization fields, which will be widely used in China's agriculture The upgrading and transformation of production technology, the increase of national investment in agricultural industrial policies, the western agricultural development and the efficient agricultural utilization of land resources will bring new application markets to the field of special oxides.

Since most fields of new energy, such as solar energy, wind energy, wave energy, ocean current energy and tidal energy, do not belong to base load power, they are affected by natural conditions such as weather, season, ocean wave and ocean current, and have natural instability defects, the R & D and construction of nuclear power based on nuclear fusion and nuclear fission and China's leading Tokamak device will have an impact on high temperature resistance, it also puts forward higher requirements for China's tungsten alloy production technology and processing capacity, which will be a good development opportunity for high-performance tungsten alloy production enterprises.



△EAST Tungsten Diverter of China Nuclear Fusion Experimental Device

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1.3 New Energy Vehicles (EVs)

As mentioned above, the development of new energy vehicles and all kinds of new energy public transport vehicles avoids the use of a large number of tools in the field of traditional fuel engines, which is bound to greatly reduce the consumption of cemented carbide. At the same time, the tools and molds required by the new energy vehicles will also offset the shrinking market of cemented carbide tool consumption. More importantly, the most important thing in the field of new energy the most important thing is the energy storage battery, which is also an essential part of almost all new energy storage.

According to the research report, SNE research, a global emerging energy market research organization, predicts that by 2023, the global demand for power batteries for electric vehicles will reach 406 Giga watt hours (GWH), while the power battery supply is expected to be 335 Giga watt hours (GWH), the gap is about 18%. By 2025, this gap will expand to about 40%.

Recently, major battery manufacturers in China, such as CATL (Contemporary Amperex Technology Co., Limited) and BYD Company Limited, and new energy battery materials' manufacturers, such as Ganfeng Lithium, Nanjing Hanrui Cobalt Co., Ltd and Xiamen Tungsten, are facing huge market outlets and continuous demand. Their sales performance and stock price are rising rapidly one after another.



△Tungsten Trioxide

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In the recent research and application development of battery technology, special doped tungsten oxide, nano oxide and rare earth mixed compounds of tungsten have greatly improved and improved the safety, rapid charge and discharge, energy storage efficiency and other performance of new energy batteries. Therefore, with the development and evolution of new technology and the maturity of production technology, special tungsten chemicals will have a great market promotion space.

2. Investment & of New Infrastructure

The construction of new infrastructure, referred to as new infrastructure for short, mainly includes the construction of 5G base station, UHV, intercity high-speed railway, urban rail transit, charging pile of new energy vehicles, big data center, artificial intelligence and industrial Internet, involving many industrial chains. The new infrastructure is oriented to high-quality development with the concept of new development, driven by technological innovation and based on information network In March 2020, the Standing Committee of the Political Bureau of the CPC Central Committee held a meeting to speed up the construction of new infrastructure such as 5G network and data center, and the 2020 government work report of the State Council proposed to focus on supporting "two new and one heavy" (new infrastructure construction, new urbanization construction, transportation, water conservancy and other major projects) construction. According to the first batch of 48 major projects implemented in Shanghai from 2020 to 2022 alone, the total investment is expected to reach 270 billion Yuan. China's new infrastructure will be driven by tens of trillions of investments and huge surrounding industries, and will also inject a huge driving force into China's future economic development.



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△New Type & Traditional Infrastructure

The current new infrastructure defined by the national development and Reform Commission mainly includes three aspects: (a) Infrastructure based on the evolution of new generation information technology, such as communication network infrastructure represented by 5G, Internet of things, industrial Internet and satellite Internet, new technology infrastructure represented by artificial intelligence, cloud computing and blockchain, and computing infrastructure represented by data center and Intelligent Computing Center; (b) Apply Internet, big data, artificial intelligence and other technologies to support the transformation and upgrading of traditional infrastructure, so as to form integrated infrastructure, such as intelligent transportation infrastructure, intelligent energy infrastructure and other in-depth integrated infrastructure; (c) support public welfare innovation infrastructure such as scientific research.

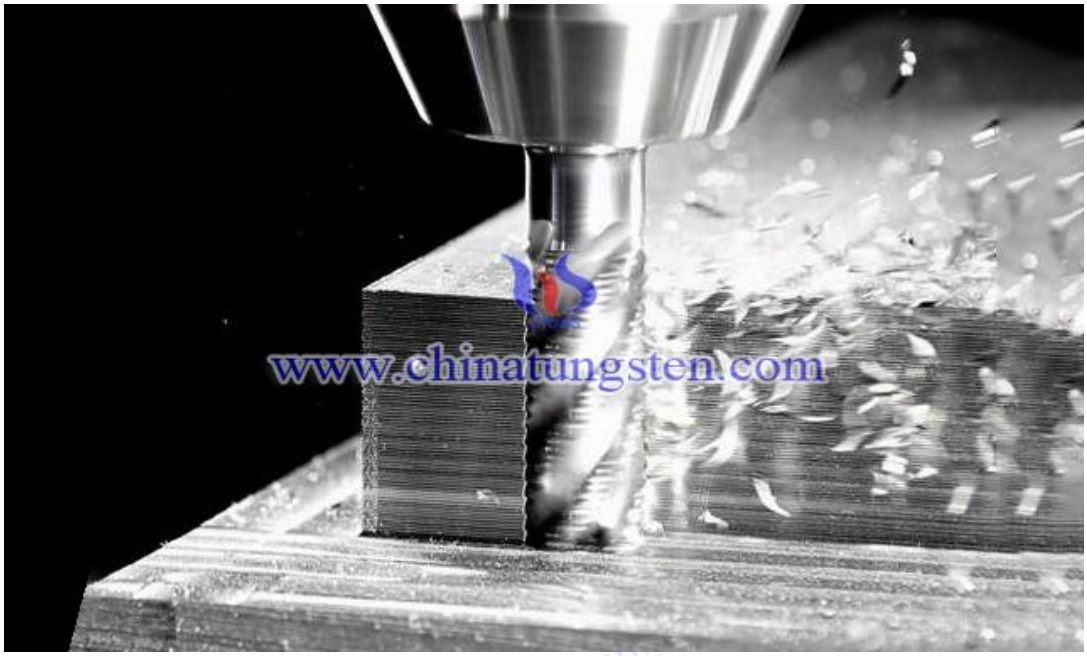
According to relevant industries and plans, China's new infrastructure is currently at the forefront of the world in many fields, and the technology represented by 5G is in the leading position in the world. Relevant infrastructure construction is also independent and the construction speed is constantly strengthened. China's tungsten products industry will face a strong outlet for new infrastructure and take off strongly in the future.

2.1Infrastructure Generated by the Evolution of New Information Technology (IT)

The infrastructure generated by the evolution of the new generation of information technology includes the communication network infrastructure represented by 5G, Internet of things, industrial Internet and satellite Internet and its surrounding application industrial chain, forming new technology infrastructure represented by artificial intelligence, cloud computing and blockchain, and computing infrastructure represented by data center and Intelligent Computing Center In the new information technology industry chain, the tungsten products industry will make great achievements in the construction and application of a new generation of information technology infrastructure and obtain a great opportunity for its own development. For example, the chip-based silicon material chip production and cutting requires a large number of new metal tungsten molybdenum (including silicon carbide) sapphire long crystal furnaces, as well as a large number of cemented carbide NC slicing tools.

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△Cemented Carbide NC Tools

(A) 5G Base Station Construction

5G (5th generation mobile communication technology) The new generation of broadband mobile communication technology with the characteristics of high speed, low delay and large connection is the network infrastructure to realize the interconnection of man-machine and things. Its three application scenarios are enhanced mobile broadband, ultra-high reliable low delay communication and massive machine communication. 5G will solve the problems of people and people in the application fields of Internet of things such as mobile medical treatment, Internet of vehicles, smart home, industrial control and environmental monitoring Communication between people, people and things, and things and things.

Compared with other countries in the world, the R & D and infrastructure construction of 5G communication technology in China are moderately ahead of the layout. The construction of 5G technology based on mobile communication has developed rapidly in the fields of big data center, 5G enabled Industrial Internet and deep integration of artificial intelligence, thus creating a historic opportunity in the new round of scientific and technological revolution and industrial reform And then promote the integrated development of the new generation of information technology and manufacturing industry, accelerate the digital and intelligent transformation of industrial enterprises, improve the digital, networked and intelligent development level of manufacturing industry, promote the transformation of manufacturing mode, production mode and enterprise form, and

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drive industrial transformation and upgrading.

The core of 5G communication technology is high-speed, high-quality and large-scale mobile communication. Its industrial upgrading will drive a series of new industrial demand mainly for cutting tools and molds. Taking the rapidly developing 3C industry as an example, its rapid growth and renewal iteration have strong demand for production machines and tools and increasing performance requirements. Therefore, it promotes the demand for special cemented carbide PCB precision drill bits in China, At the same time, the demand for high-performance RF antenna will grow rapidly with the construction of 5G high-density, which will make the demand for special tungsten compounds grow at a high speed simultaneously. China Tungsten online has continuously received the customer demand for such special doped tungsten compounds in recent years.

The demand of 5G technology for the hardware of electronic information products such as chips will have a huge demand for the production capacity of tungsten-based alloys dominated by tungsten copper alloys in China. At present, the production capacity of tungsten-based alloys required by China's IT industry, such as tungsten copper heat sink materials and packaging materials, is very small, the flexibility and technical research are relatively slow, and there is still a lot of room for development.



△Tungsten Copper Alloy Heat Sink Package

Based on the analysis of this paper, we believe that China's tungsten products industry will face further overcapacity of a large number of standard chemicals in the future, and there

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will be a large demand for small batch high-performance special tungsten compounds, which can meet the needs of R & D and flexible production of such products, and will also obtain high-speed growth and strong competitiveness.

(B) 6G Technology R & D & Its Application

At present, based on the forward-looking advantages and production and processing capacity of 5G technology, China still has a huge first mover advantage in 6G technology research and patent application, and accounts for more than 40% of the patented technologies. We can predict that 6G technology will educate 5G technology to enter our real life faster, and several 6G software and hardware experts will not make decisive production and application. Therefore, tungsten More and more products will benefit from the application and evolution of 5G-6G technology. Therefore, we can be more optimistic about the development of tungsten products industry driven by the new generation of communication technology.

2.2 Application Internet Convergence Infrastructure

Internet convergence infrastructure based on 5G technology mainly refers to the integration infrastructure formed by the deep application of Internet, big data, artificial intelligence and other technologies to support the transformation and upgrading of traditional infrastructure. The construction of intelligent manufacturing is based on big data and opportunity big data center. Industrial Internet is the industrialization and industrial empowerment of intelligent manufacturing.

China's tungsten products industry, especially small and medium-sized tungsten products manufacturing enterprises, has not yet built their own big data center, nor has there been a perfect intelligent manufacturing planning and implementation, which will make many tungsten products industries in China face data fragmentation, make it difficult to embed them smoothly into the digital economy and industrial Internet, and make it difficult to realize the maximum intelligent manufacturing format. It is the lack of data and integration of the current industrial chain that has brought great opportunities for the transformation and upgrading and digital empowerment of China's tungsten products industry, because China's tungsten products industry has resources, technology and huge market advantages. At the same time, the tungsten products industry has a short industrial chain and relatively intensive industrial concentration, which has the possibility and feasibility of forming an industrial Internet in terms of region and products, At the same time, in many enterprises, only industrial and product upgrading based on industrial Internet and intelligent manufacturing can have sustainability and technical advantages.

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2.3 Regional Integration Weaknesses

According to the national overall development plan, the new infrastructure includes solving the major infrastructure problems of weak links such as geographical boundary constraints and insufficient regional energy security, as well as the space of economic development advantages such as central cities and urban agglomerations with short board as the main task. For example, accelerate the layout of intercity high-speed railway, intercity rail transit and UHV power hub, comprehensively promote the construction of cross regional infrastructure, and improve the infrastructure interconnection level of central cities and key urban agglomerations.

High speed railway, intercity rail infrastructure based on high-speed railway technology and UHV power transmission and transformation technology are leading industrial clusters with intensive patent technology and mature technology in China. Such industries will greatly promote China's regional development imbalance, regional cooperation and regional interoperability, and will also be an important measure to promote common prosperity, this will also generate new incremental and high-quality development impetus for China's cemented carbide, tungsten copper alloy and other products.



△High Speed Railway of China

3. Medical & Health Industry

In the process of China's rapid urbanization, the original distribution pattern of medical

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resources and inclusive population have been changed. The original distribution pattern of medical resources mainly in cities and towns has gradually expanded to low-level medical institutions in the process of China's economic and social progress, and a large number of farmers entering cities also pose a great challenge to urban medical resources, It has completely changed the original pattern of medical people, and medical services pay more attention to the problem of "blue collar health", which will increase the demand for medical resources several times compared with the original.

With China's gradual entry into an aging society, the medical needs of society and individuals will expand rapidly. At the same time, the society also puts forward higher requirements for medical quality. In recent years, China's high-end medical treatment has been sinking, and medical means such as CT, X-ray and laser have been fully entered into county medical centers and even township medical services.

The demand, normalization and popularization of radiation medical treatment for various cancers will greatly increase China's radiation medical equipment. Regardless of domestic and foreign medical equipment, the demand for tungsten alloy parts shielding radioactive sources will eventually come from the processed products of China's tungsten products industry, even if the final finishing processing is not in China, according to the market experience and customs data analysis results of China Tungsten online for many years, most tungsten alloy shielding parts come from Chinese tungsten products processing enterprises. Therefore, we believe that the rapid growth of China's huge medical market, the demand for medical quality such as precision treatment, and the rapid integration and popularization of remote Internet medicine will bring great demand increment and technical upgrading requirements to China's tungsten industry.

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△Tungsten Heavy Alloy Radiation Shielding for Medical Instruments

4. Military & Aerospace Industries

Under the situation of many years of containment and suppression by the west, China has long adhered to the independent road of military and aerospace development. With the arduous efforts of several generations, China's military science and technology research and development have achieved fruitful results. We have achieved major breakthroughs and considerable development in various fields of land, sea, air and space, and all kinds of important weapons of various types of countries continue to emerge.

According to the reading and analysis of relevant documents by China Tungsten online, most of the high-performance tungsten alloy kinetic energy armor piercing bullets, armor breaking bullets and tracer bullets, large-diameter special rifle bullets in the field of China's army are processed and produced with rotary forged tungsten alloy rods, and their performance catch up with or even surpass the similar products of major western developed countries, and China adheres to the "green bullet" The guiding ideology of the National People's Congress should avoid the old way of using depleted uranium (DU) bombs with radioactive damage that seriously endanger the environment and civilians in Iraq, Kosovo and other places. At the same time, tungsten alloy prefabricated fragments are widely used in individual blasting, shells, rockets and so on.

In terms of air military, China also uses a large number of high-performance tungsten alloys doped with rare earth. For example, the ahid high explosive bomb first developed by

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Switzerland uses a large number of tungsten alloy Nuggets between 3x3x3 ~ 6x6x6x6 as lethal blasting particles. At the same time, tungsten alloy components with high density and high strength are required for ground penetrating bombs for the air force.



△Tungsten Heavy Alloy Bullets, Armors for Military

Tungsten alloy is also widely used in naval weapon systems and sea to shore weapon systems. At the same time, tungsten alloy is an excellent guidance gyroscope material, tungsten copper alloy sweating material is also an excellent heat dissipation material for rocket and aerospace engine nozzles, and so on. China's tungsten products industry has actively participated in the research and development of dual-use technology in the process of enriching the country and strengthening the army, it has made and will continue to make significant contributions to China's national defense.

END OF THE PART IV OF VII OF THIS PAPER.
THE 5TH PART OF THIS PAPER, THE AUTHOR WILL ANALYZE THE ADVANTAGES & DISADVANTAGES OF LEADING, SMALL & MEDIUM-SIZE ENTERPRISES IN TUNGSTEN INDUSTRY, SO AS TO FIND A WAY TO BKREAK THROUGH FOR SMALL & MEDIUM-SIZE ENTERPRISES OF CHINA.

(to be continued)

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MARKET & PRICE TREND OF TUNGSTEN

CHINA, 2021

PART V of VII

Advantages & Disadvantages of Large Tungsten Enterprises

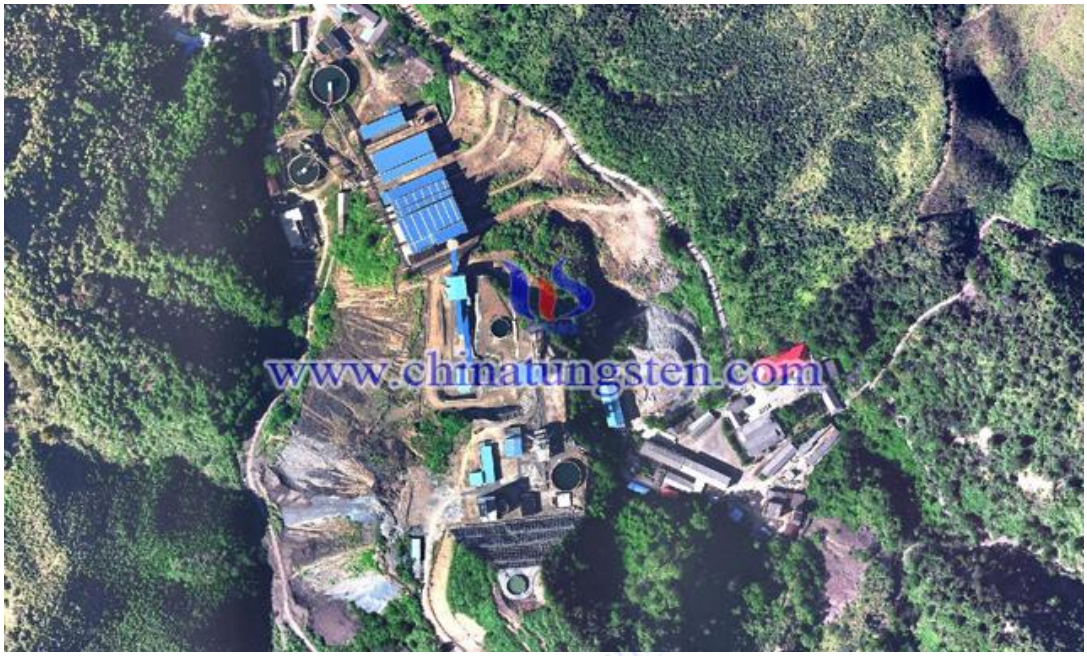
The first part of this paper analyzes the impact of macroeconomic environment factors on the processing and production of tungsten products. The second part further analyzes various cost factors that directly and deeply affect the production and operation links of tungsten product prices, and reveals the deep-seated causes of price fluctuations since June and the irreversible impact on the future. The third part analyzes the spillover effect of tungsten product price rise Future opportunities and risks, the fourth part of China Tungsten online makes a superficial analysis on the future opportunities and possible tuyeres of China's tungsten products industry, and the fifth part hopes to make a superficial analysis on the advantages and disadvantages of China's large tungsten products enterprises according to myself.

At present, China's tungsten products industry is mainly dominated by several large tungsten products enterprises such as Xiamen Tungsten, China Moly, China Tungsten High tech, Jiangxi Tungsten Group, China Minmetals, Rising Nonferrous Metals, ZhangYuan Tungsten, Xianglu Tungsten. They have a large share in the tungsten products market, export market, investment and financing capacity, human resources and scientific and technological R & D Profitability and market leading ability play a leading role. Through comprehensive research and judgment, its advantages come from the historical inheritance of China's early discovery and mining history of tungsten products and the planned economy constitution in the early days of the founding of the people's Republic of China, as well as the results of the efforts of enterprises represented by Xiamen tungsten industry in the market tide since the reform and opening up.

The so-called "its prosperity is also vigorous and its death is also sudden". On the contrary, several major tungsten products enterprises in China have absolute advantages in natural and social resources and occupy the leading position in the industry, but their disadvantages also stem from this under the tide of the rapid development of contemporary platform economy and industrial Internet.

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△Aerial View of Dajishan Tungsten Mine, Jiangxi Province

1. Advantages of Large Tungsten Enterprises

China's tungsten resources occupy an absolute dominant position in the world, while several large tungsten products enterprises in China occupy half of the country, and have an absolute dominant position in the tungsten products industry. Not only in terms of tungsten ore resources, the resource ownership of several large tungsten enterprises also lies in their inherent social resource capacity and dominant position in state-owned enterprises, It lies in its human resources, technology and part of the market monopoly and customer acquisition ability based on its strong financial advantages.

1.1 Capital Advantages of Large Tungsten Enterprises

At present, China's typical large-scale tungsten products listed enterprises take several tungsten products enterprises on the A-share main board as examples, which basically represent the overall situation of China's tungsten products industry: compared with other non-ferrous metal enterprises such as copper, aluminum, lead and zinc, China's tungsten products industry generally has a small volume and narrow industrial layout (except for the new energy plate laid out by Xiamen Tungsten for many years), The profitability is low (the P / E ratio of listed companies is generally close to or higher than 50 times), and the performance in the stock market is also very low in total market value, net assets and profit margin. On the one hand, this situation shows that most products in the tungsten products industry are concentrated in primary products, such as tungsten chemicals and

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other traditional products, with low technical content, CNC cutting tools, nano materials There are few high-end products such as spherical tungsten powder suitable for 3D printing technology, and the market competitiveness and profitability are insufficient, resulting in many problems such as insufficient R & D investment in new products and new technologies; Within the tungsten products industry, these large tungsten products enterprises have strong financing ability, and have obvious capital advantages compared with small and medium-sized enterprises.

Capital advantages not only give large tungsten enterprises advantages in exploration rights, tungsten mine development and human resource attraction, but also give large tungsten enterprises a better ability to sell high and absorb low, adjust the market and inventory, and have a more favorable market and cost control ability in the process of market game with large market fluctuations.

我国大型钨制品上市企业基本情况
（2021 年 7 月 16-20 日资料）

公司名称	注册资本（人民币）	总市值（2021 年 7 月 16 日数据）
洛阳栾川钼业集团股份有限公司	431985 万元	1370.54 亿
厦门钨业股份有限公司	141846 万元	380.86 亿
广晟有色金属股份有限公司	30180.2 万元	131.13 亿
中钨高新材料股份有限公司	107386 万元	124.52 亿
崇义章源钨业股份有限公司	92416.7 万元	101.29 亿
株洲欧科亿数控精密刀具股份有限公司	10000 万元	75.87 亿
株洲华锐精密工具股份有限公司	4400.8 万元	74.00 亿
广东翔鹭钨业股份有限公司	27300 万元	27.68 亿

△Large Tungsten Products Listed Enterprises in China

1.2 Tungsten Mines & Ores Resource advantages of Large Tungsten Enterprises

In terms of tungsten resources, the 2019 negative list of market access issued by the national development and Reform Commission and the Ministry of Commerce stipulates that new and expanded tungsten mining projects with tungsten metal reserves of less than 10000 tons and annual mining scale of less than 300000 tons (except for deep and edge resource mining and expansion projects of existing tungsten mines) are included in the prohibited access projects. The "ban on small-scale and large-scale" tungsten mining is

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conducive to the replacement of old mine resources, promote large-scale and intensive exploitation of tungsten resources and protect the ecological environment, but it also puts pressure on the total amount control of tungsten mining.

After the implementation of the new deal, three tungsten mine development and utilization plans have been reviewed by the Ministry of natural resources. For new mines and projects of tungsten products, more and more strict environmental protection and other policy controls, more and more capital investment requirements and improved development technology make large tungsten enterprises have certain advantages and opportunities in obtaining tungsten resources. The advantageous position of large tungsten enterprises at the source of tungsten industry chain makes them have cost advantages in integrating subsequent processing of tungsten products.

1.3 Export License Advantages of Large Tungsten Enterprises

The Ministry of Commerce and the General Administration of Customs continue to implement license management on tungsten and tungsten products. The export of tungsten and tungsten alloys (particles < 500 microns) can be exempted from applying for export license, but it is necessary to apply for the export license of dual-use items and technologies of the people's Republic of China in accordance with regulations. The Ministry of Commerce continued to implement the state-owned trade policy for tungsten export, and the number of state-owned trading enterprises for tungsten export increased from 14 to 16. At present, in addition to the processed metal tungsten products, such as tungsten wire, tungsten electrode, tungsten alloy, cemented carbide products and other intermediate products belong to the scope of license control. The license is only granted to a few large tungsten products enterprises, which actually gives them an inherent competitive advantage in the international market, although to some extent, it has prevented China's tungsten products from competing with each other and competing for the market at low prices in the international market, it has also formed an incomplete and fair competition pattern in the domestic market and a situation of insufficient marketization.

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△Hukeng Tungsten Mine

1.4 Marketing Game Advantages of Large Tungsten Enterprises

China's large tungsten products enterprises have many advantages such as capital, tungsten resources, human resources and export license. These advantages are superimposed, which makes them have great advantages over small and medium-sized enterprises in terms of government investment and financing policies, industrial land supply, water and power supply, tax preference and human resources in the process of market game, Especially for local governments in remote areas where tungsten resources are located, large tungsten products enterprises have obvious advantages in bidding, environmental assessment, tax preference and return; Similarly, its dominant position is more prominent in the market game with small and medium-sized tungsten products enterprises.

The price in the market is determined not only by the scarcity of tungsten products, the relationship between market supply and demand, the actual needs of both buyers and sellers, capital capacity and many other factors, but also by the psychological factors of both buyers and sellers. Therefore, any fluctuation in the market price of tungsten products will go up or down, Insiders generally pay close attention to the short-term quotation policies and medium and long-term price expectations of several large tungsten products enterprises. Almost every price fluctuation is basically the final result of the game between several large enterprises in the market.

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The head advantages of large tungsten products enterprises have their own advantages and disadvantages, so that China's tungsten products industry can better participate in international market competition and compete for the international voice of tungsten products industry. At the same time, it also limits and hinders the benign competition and rapid development of China's tungsten products industry. Some enterprises use their own resource advantages to obtain market game advantages, it may also make them competitive, especially in technology and market R & D investment enthusiasm and investment in projects with certain risks, with a natural preference to protect vested interests and dominant positions and avoid uncertain risks.



△Yaogangxian Tungsten Mine

2. Disadvantages of Large Tungsten Enterprises

2.1 Disadvantages of Large Tungsten Enterprises in International Market

At present, most of China's large tungsten products enterprises are listed companies or state-controlled enterprises dominated by state-owned enterprises. Most of them have inherent advantages in resources, manpower and capital. Therefore, they enjoy a high reputation and historical accumulation in the tungsten products industry, and most of them are "dominant" in the fields of mining, smelting and finishing. But the so-called big tail is also an unavoidable problem. It also has its own difficulties and historical burden. In the face of the new and complex international market competition environment, China's tungsten products enterprises, especially the leading enterprises, may face various fierce

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competitive environments, especially some unpredictable new market and non market resistance and problems.

(A) The G20 Proposes to Set a Global Minimum Tax Rate of 15%

On July 10, the G20 Finance Ministers and Central Bank Governors issued a communiqué and reached a historic agreement on a more stable and fair international tax framework. The G20 supports measures such as profit redistribution of multinational enterprises and setting the global minimum corporate tax rate. In principle, 131 countries agreed to ensure that the minimum corporate tax rate is at least 15%, and ensure that large enterprises pay taxes in the place where they sell. The minimum tax rate is designed to prevent multinational enterprises from transferring profits around the world in order to pay as little tax as possible. Previously, the group of seven (G7) also expressed support for setting the global minimum corporate tax rate at least 15%. It is estimated that if this tax rate is set to 15%, it will generate about $150 billion more taxes every year at the global level. The international consensus on the minimum tax rate has basically eliminated the tax preference advantages of the previously popular offshore tax-free island countries, which will pose new challenges to the future global layout, tax regulation, financing and fund-raising in the international market of China's large tungsten products enterprises, it brings new variables and uncertainties to many large private enterprises with plans to go to sea and financing and listing at home and abroad.



△Shizhuyuan Tungsten Mine

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(B) G20 Supports Carbon Pricing Collectively for the First Time

On July 12, G20 finance ministers collectively supported carbon pricing for the first time after the global tax agreement talks, saying that this once controversial idea was one of the "a wide range of means" to deal with climate change. "Addressing climate change and biodiversity loss and promoting environmental protection remain the most urgent priorities." these solutions may include "using carbon pricing mechanisms and incentives". They expressed their support for carbon pricing in the communique for the first time. It also emphasizes the importance of "effective carbon pricing reflecting the real carbon cost". "A key element of reducing emissions is high carbon pricing."

On July 16, the national carbon emission trading was officially launched in Shanghai environment and energy exchange. The success of the first national carbon trading at the price of 52.78 Yuan per ton means that China's carbon emission trading market will become the largest carbon market covering greenhouse gas emissions in the world. Carbon tax and carbon pricing. Although the national carbon market is only included in the power generation industry at present, during the 14th Five Year Plan period, The eight high energy consuming industries, such as steel, nonferrous metals, petrochemical, chemical industry, building materials, papermaking, electric power and aviation, may all be included in the national carbon trading market. This approach is more in line with international experience. In the future, the quota allocation method may be based on the baseline method, that is, it is allocated according to unit output, and energy consumption efficiency rather than total output may become the key factor.

The policy formulation and refinement of carbon tax and carbon emission right will gradually enter the market-oriented operation, which will also become another kind of non-tariff trade barriers and policy tools available to the West. The tungsten products industry, which is a high energy consuming industry, will face a new round of industry reshuffle challenges. For large tungsten products enterprises, they will not only face more stringent emission policies of the environmental protection department and pay higher environmental protection costs, but also face a new round of survival of the fittest in management and technical competition.

Enterprises should not only compete with their domestic counterparts, Enterprises with sufficient hydropower and photovoltaic power in remote areas may have advantages in carbon tax; On the other hand, to stand on the same starting line with international peers, resource advantages may also become some disadvantages under the carbon tax policy, which is a major change in the future that China's large tungsten products enterprises have to think deeply and actively plan.

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△Workshop of Xiamen Tungsten

2.2 Short term Interest Driven by Large Tungsten Enterprises

Recently, according to the statistics of SASAC, central enterprises achieved an operating revenue of 17.1 trillion Yuan, a total profit of 1.31 trillion Yuan and a net profit of 1.02 trillion Yuan in the first half of the year, with an average growth rate of 8.7%, 17.9% and 20.6% respectively, of which the net profit of central enterprises exceeded 1 trillion Yuan for the first time in the first half of the year. This shows the important role and leading position of China's central enterprises in the national economy, and also shows that profit is an important hard index in the national assessment and evaluation system for central enterprises and large enterprises.

China's large tungsten products enterprises are not only large central and state-owned enterprises, but also mostly listed companies, which makes most large tungsten enterprises not only face the performance evaluation of relevant national departments, which will be directly related to the promotion of senior managers, but also face the pursuit of profits by all shareholders of listed companies and the expectations of shareholders for stock prices, So they have to do everything possible to pursue annual short-term profits, and it is difficult to make long-term plans focusing on R & D and based on long-term strategies, which can be continuously implemented and smoothly implemented.

In recent years, China's tungsten concentrates output accounts for about 80% of the global

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total, and its consumption accounts for more than 50% of the global total. However, more than 60% of exported tungsten products are primary products, with low technical content and profitability. China's high-end cemented carbide cutting tools have not yet reached the international advanced level, while digital control cutting tools have only about 20% self-sufficiency, and more than 70% need to be imported, With the improvement of the localization of China's IT industries such as chips and the acceleration of industrial upgrading, the gap of high-end tools will continue to expand. This trend is also reflected in the lack of profitability of China's Tungsten enterprises.

The R & D and production of high-end cutting tools is a long-term process, which requires a strategic stage of sustained high investment for a long time, which means that the enterprise can not obtain benefit return in the short term with a large amount of investment in the long term, which makes the executives of listed companies or state-owned enterprises have to face a dilemma between shareholder benefit return and technology R & D investment. Many enterprises continue to invest heavily in the production of raw materials with more technology accumulation and mature technology, which fully shows that many enterprises prefer to invest in intermediate products with high revenue and low risk in the short term, but do not have high enthusiasm for medium and long-term technical research. Therefore, the annual profit data pursuit of large tungsten products enterprises offsets the power of long-term technical investment.



△Workshop for Sintering Vacuum Furnace of Zhangyuan Tungsten

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2.3 Sensitivity of Some Product R & D

In terms of the current political, economic and trade relations between Europe, America and China, most of the large tungsten products listed enterprises must disclose their data and business operations, so they are in a sensitive area in participating in the development of military and civil dual-use projects and product production in China, and may conflict with their market competition in the international market, Therefore, large listed tungsten products enterprises may not enjoy an advantageous position compared with private enterprises and unlisted enterprises in the research and development of some products.

2.4 Management & Human Resources Issues

Large tungsten products enterprises, especially large listed tungsten enterprises or large state-owned enterprises, generally have problems such as overlapping institutions, complex structure, high allocation of human resources and failure to give full play to their actual effects, and there is a waste of human resources in varying degrees. Due to the high verticality of institutions, there are certain promotion expectations, which also limits the liquidity and is easy to form the phenomenon of "cocoon room" and involution, A large human resource barrier lake is formed, which makes the human resource cost of large enterprises high, the personnel environment complex, easy to produce internal friction and low operation efficiency.

Cocoon room was originally a concept in the field of information. Information cocoon room means that people's attention to the information field will be habitually guided by their own interests, so as to shackle their life to the "cocoon room" like a cocoon. The public living in cocoon houses can hardly be considerate, because their own views of their ancestors will gradually take root. Some countries or enterprises go to disaster for this reason. For leaders and others living in relatively fixed "cocoon houses", this is a warm and friendly place, but the major mistake is the price of comfort. Relatively comfortable "cocoon houses" may become a terrible nightmare for private people, public institutions, or public and private enterprises.

China's tungsten products enterprises are easy to form two normal. If the treatment is not high and there is no hope of promotion, such as private enterprises, personnel mobility is large and it is difficult to form a relatively fixed team and combat effectiveness; The other is that if the treatment is high and there is a certain rising space, it is easy to form a serious involution phenomenon. From a macro perspective, China's tungsten products industry as a whole seems to have formed a huge cocoon room, and some enterprises have also formed a cocoon room to a certain extent, which will seriously hinder fresh blood from

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entering the tungsten products industry, or an enterprise personnel flows internally and forms a self-centered cocoon room, and it is difficult for external talents or internal bottom employees to obtain benign flow or competition, It seriously limits the innovation and breakthrough development of industries and enterprises.



△Workshop of China Moly (Luoyang Molybdenum)

2.5 Serious Involution in Tungsten Enterprises

Involution refers to the phenomenon that the same industry competes to make more efforts to compete for limited resources, resulting in the decline of individual "income effort ratio", which can be regarded as the "inflation" of effort, or the phenomenon that a certain model stagnates or cannot be transformed into another advanced model after reaching a certain form at a certain stage of development. For the economy, a certain production mode has no revolutionary development for a long time, is in simple repeated reproduction, can not improve the unit per capita output value, and the production or industrial mode with diminishing marginal benefits is the growth without development, that is, "Involution".

The profitability of China's tungsten products enterprises has been low for a long time, and the investment of employees and their own resources has been growing rapidly. In most cases, enterprises only invest more funds to obtain more tungsten resources, process primary products and sell them to obtain enterprise cost compensation, which is still in an invisible "life economy" mode. The development of tungsten products industry over the

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past few years has not fundamentally broken this operation mode. The highest single revenue of China's tungsten products enterprises is about 20 billion Yuan (2019-2020), which is only equivalent to the lowest revenue level of several large international tungsten products enterprises. Compared with Sandvik, its revenue in 2020 is still 65 billion Yuan with a decline of nearly 20%, while that of China's tungsten products industry increased by 4% in the same period is only 74.5 billion Yuan, The realized profit was only 3.5 billion Yuan, while Sandvik still obtained a net profit of 8.4 billion Yuan when it decreased by 16% year-on-year in 2020; The more severe reality is that the revenue of Sandvik processing solutions business segment exceeds 50% of the whole tungsten products industry in China, and the profit of this business also reaches the total profit of our whole industry (3.45 billion Yuan).

近年来我国钨行业主营业务收入及利润 单位：亿元

	2016 年	2017 年	2018 年	2019 年	2020 年
收入	550.0	690.0	820.0	720.0	745.0
利润	1.0	31.0	40.0	30.0	35.0

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△Main Revenue and Profit of China's Tungsten Industry in Recent Years

(The data related to the tungsten products industry in this paper are mostly from the data in China Tungsten Industry Yearbook 2020 and China Tungsten Industry Development Report 2020 issued by China Tungsten Industry Association in March 2021. In case of improper use or mis reproduction, the author of this paper shall bear the responsibility, which has nothing to do with the original author's data and the original intention)

The high input, low output, low technology and low profitability of China's tungsten products industry are not only the lack of simple operation and management, micro governance ability and macro management, but also the potential and secretive involution phenomenon. Just as the concept of involution has become complex and ambiguous and produced more tangled related concepts, the involution of China's tungsten products industry exists not only in the industry as a whole, but also in various business segments (such as cemented carbide industry); It exists not only in the low-level repeated construction of resource utilization and smelting processing, but also in the serious internal stacking loss and ineffective allocation of human resources; It exists not only in large tungsten products enterprises, but also in many private and family enterprises.

A survey of China's major investment projects in 2020 shows our industrial development level and involution. China's newly invested and expanded production capacity from 2019 to 2020 is basically concentrated in APT, waste tungsten recovery, tungsten oxide, meta

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tungstic acid and other intermediate products, or cemented carbide bars and profiles, cemented carbide and hard surface materials, high-performance tungsten carbide powder, etc., some of which are the so-called high-end CNC tool parks in the planning The actual technical content and production capacity of NC tool project have not been recognized by the market, and its effect has not been shown.



△Micro Drill Workshop of China Tungsten Hightech Materials, Jinzhou Branch

2.6 Crisis of 6G Smart Workshop

By the end of 2020, China has opened more than 718,000 5G base stations and more than 200 million terminal connections. The 5G network with high rate, large capacity and low delay is unique in the world. The digitization, networking and intelligence based on 5G technology are the core characteristics. The fourth industrial revolution represented by intelligent manufacturing is gradually launched in China. According to the author's observation on China's tungsten products industry for many years and the research on the public data of listed companies of large tungsten products enterprises, China's tungsten products industry has not kept up with the pace of Intelligent Manufacturing in the 5G era, and it may be more difficult to keep up with the pace of smart factories under the 6G network in the future.

When China's tungsten products industry has not embedded 5G technology and cloud computing into production and operation links to deeply create intelligent manufacturing, 6G technology has come at an extraordinary speed, and the smart workshop based on the

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concept of 6G technology will be a more intense and rapid industry subversive revolution. If relevant enterprises do not timely track the application of the latest communication and computing technologies and their related software and hardware systems in production and operation management, they will most likely be subverted and quickly distanced in the near future, and will be defeated by enterprises and platforms with advanced manufacturing systems and market adaptability, China's tungsten products industry will also become a situation of relying only on the resources left by our ancestors.



△Dream of 6G Smart Workshop

In 2019, the Ministry of science and technology, the national development and Reform Commission, the Ministry of education, the Ministry of industry and information technology, the Chinese Academy of Sciences and the natural science foundation of China established a national 6G technology R & D promotion working group and an overall expert group to officially launch 6G technology R & D. in 2020, it is required to further promote innovative breakthroughs in key technologies, focusing on the integration of terahertz communication, communication perception Research on 6G application scenarios such as 6G potential technologies such as communication and artificial intelligence integration. At the same time, the United States has launched the research on the next generation (NextG) wireless broadband network with flexibility and intelligence; Nokia of Finland and Ericsson of Sweden led the establishment of hexa-x alliance; Set up the "6G flagship" organization to conduct early research on 6G communication technology; Japan has cooperated with the United States to formulate a b5G development roadmap for b5G / 6G technology research; South Korea has more radically put forward the vision of

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commercializing 6G technology in 2028 and defined the requirements of 6G services three for "performance, architecture and trustworthiness". The South Korea's "future mobile communications R & D strategy in the era of 6G" has clearly identified five pilot areas, including digital medical, immersive content, self driving cars, smart city and intelligent factory.

The popularization of 5G technology and the R & D and promotion of 6G technology are great benefits for the tungsten products industry in the field of hardware construction: (a) the rapid upgrading of the communication industry will lead to more hardware updates and applications, which is a huge stock demand and incremental expectation for cemented carbide tools and molds; (b) The opportunity and power of technological upgrading will profoundly change the state of China's tungsten products industry. The market driven and led by communication technology will promote the enterprise's market immediate response ability, transform the production process and process, and shift from the traditional production and marketing mode to the 2C flexible intelligent manufacturing mode based on platform and data.

However, if we follow the traditional management concept and thinking and the traditional production and supply and marketing mode, we will not be able to keep up with the needs of the rapidly developing industrial chain, adapt to the market response mechanism of rapid change, deploy the industrial Internet production mechanism in time or even in advance, and surpass modern production with intelligent workshop, which will be defeated by the new production mode.

3. Opportunities for Tungsten Enterprises

3.1 Tungsten Products Intelligent Manufacturing Platform Industrial Internet

The so-called emerging industries, from Alibaba, Taobao to Amazon, to live e-commerce and social e-commerce, are actually a kind of Internet B2C business model, the transformation of the Internet to the de intermediation of the surface layer of the industry, and the result of the continuous evolution of the Internet. So far, these can not change the basic industrial structure and deep-seated problems, that is, the dominant market of traditional industrial production, what producers produce, consumers choose. E-commerce with all kinds of gimmicks has not changed and reconstructed the factors of production. Only the industrial Internet can really change the mode of production of the industry and people's consumption habits and consumption patterns.

The Internet of tungsten products industry should reshape and transform the vertical industrial chain and value chain of tungsten products industry or local products based on

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Internet technology and ecology, make full use of information technology and Internet platform, give full play to the optimization and integration role of large tungsten products enterprises in the allocation of production factors under Network ecology, and realize the deep integration of the Internet and China's tungsten products industry, Form a unique Internet Ecology and industrial form of tungsten products.



△Internet Intelligent Manufacturing Industry

Large tungsten products enterprises should combine their own advantages with tungsten products industry information and platform enterprises to launch and promote the Internet platform of tungsten products industry, and build an industrial level productive sharing platform for tungsten products industry through the opening of the platform, Empower various enterprises upstream and downstream of the tungsten products industry chain step by step, drive the common development of small and medium-sized enterprises in the tungsten products industry chain, and realize the overall improvement of the tungsten products industry. Large tungsten products head enterprises can also be the head of tungsten products enterprises that have evolved into a new model based on the Internet, so as to realize their own fission growth, it can also surpass the advantageous enterprises in the current international market.

China's large tungsten products enterprises should, in combination with China's current policies to encourage industrial Internet construction, actively layout the industrial Internet construction of tungsten products industry, integrate the industry and their own resources, and prepare to build an automatic adaptive business demand and process

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based on intention, virtualization, programmability and open platform network controller; The five technical fields of network technology automation, Al, multi cloud network, wireless and network security are integrated into the tungsten products industry internet based on the new network mode, and the industrial experience and technical advantages are used to build a large-scale, flexible and secure industrial Internet platform for the whole industry or for its own industrial chain, using artificial intelligence (AI) technology Capital and human resources capabilities build their own multi cloud network, gradually accumulate a large number of tungsten products industry and production and operation data, and obtain a series of possible options and find the best results and solutions in all links of management, market, user and production, product, technology selection, defects and improvement schemes through machine learning (ML) and machine reasoning (MR), With the passage of time and the accumulation of experience, we can make use of and improve knowledge, make our machines link all links such as production, supply and marketing and interact with each other, make automatic judgment and reasoning, improve production technology and process flow through systematic self-learning and training, and improve product quality and stability.

For more complex tungsten products, various data, such as particle size, pressure Purity, temperature and time are interrelated, and China's tungsten products industry will gradually build its own industrial Internet to realize customized services, intelligent manufacturing and flexible manufacturing, so as to subvert the domestic and international industrial pattern of tungsten products industry, strengthen and consolidate the dominant position in the international market, and make China become a powerful country of tungsten products from a large country of tungsten products resources.

If China's tungsten products industry can successfully build an industrial Internet and cluster based on 5G / 6G, it can realize the unity and coordination of online and offline, virtual and reality, physical resources and data resources with existing natural resource advantages, and realize the transformation and upgrading of China's tungsten products industry.

3.2 Patent technology & Standard Formulation

Large tungsten products enterprises should make use of China's resource advantages, large-scale production time, years of accumulated experience and huge domestic market advantages, make use of their own talent advantages, increase R & D capital investment, actively strive for the support of national industrial policies and local governments, actively develop and apply for relevant patented technologies, and combine with China Tungsten Industry Association Non ferrous metal industry associations and other industry organizations actively formulate industry standards and strive to promote them in

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production and marketing events, so as to make the standards of China's tungsten products industry become internationally accepted standards and bear important responsibilities for the development of China's tungsten products industry. At the same time, China's large tungsten products enterprises can help China Tungsten Industry Association actively participate in the affairs of the international tungsten Association, make practical use of its own resources and market dominant position, occupy a leading position in the international market, play a leading role, and create a good domestic and foreign business environment for China's tungsten products industry, It can also resist unfair competition from western developed countries and the exclusion and pressure of non market factors.

3.3 Leading the Industrial Chain to Sail to Sea of Global Markets

At present, China's tungsten resources are gradually exhausted, the pressure of environmental protection is greatly increased, the cost of human resources is high, and the carbon tax policy is gradually implemented, China's large tungsten enterprises with capital and technical advantages can take advantage of the comprehensive advantages such as technical cost in the development of tungsten resources, Lead the relevant enterprises and surrounding supporting industrial chains in various processing links of China's tungsten products to actively seek the development of tungsten resources in the international market and the production and processing close to the market, which not only shortens the carbon footprint of tungsten products, reduces the environmental pollution of China's tungsten products industry, but also enhances the international participation and competitiveness of China's tungsten products industry.

END OF THE PART V OF VII OF THIS PAPER.
THE 6TH PART OF THIS PAPER ,THE AUTHOR WILL PUTS FORWARDS HIS OPINIONS ON THE PLIGHT & BREAKTHROUGH OF CHINA'S SMALL, MEDIUM-SIZE TUGNSTEN ENTERPRISES.

(to be continued)

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MARKET & PRICE TREND OF TUNGSTEN

CHINA, 2021

PART VI of VII

Weak Position & Breakthrough of China's Small & Medium-Size Enterprises in Market Game

Since the first website was built in September 1997, China Tungsten Online has been deeply engaged in the tungsten, molybdenum and rare earth industry. Since 2000, China Tungsten Online has been building and maintaining its website for China Tungsten Association, focusing on the collection, sorting and analysis of China's and global tungsten and molybdenum market information, and cultivating the customized e-commerce business of tungsten and molybdenum products for a long time.

Since June 28 this year, after comprehensively analyzing the macro economy, the price trend of bulk non-ferrous metals, the strong rise of China's real economy after the epidemic, the fluctuation trend of international oil price, and the domestic and foreign demand for tungsten products, we believe that the price of tungsten products will rise by a large margin, and that after a long period of rise, the price of tungsten products will maintain a certain high level, We will not repeat the change trend of sharp decline after the previous sharp rise. After that, we conducted more in-depth research and data analysis. Based on this, we first put forward the view that tungsten products will rise sharply, and made a series of analysis on the reasons for the rise and relevant factors of tungsten products industry. We believe that the rise in the price of tungsten products is a double-edged sword, which has both advantages and disadvantages for enterprises. Therefore, we also put forward the possible risks and future opportunities and challenges for the tungsten products industry, and put forward our own opinions on how large enterprises, small, medium and micro enterprises should deal with these problems.

The first part of this paper analyzes the influence of macroeconomic environment factors on the processing and production of tungsten products; The second part further analyzes the cost factors that directly and deeply affect the price of tungsten products, and reveals the deep-seated causes of price fluctuations since June and the irreversible impact on the future; The third part analyzes the spillover effect, future opportunities and risks of the price rise of tungsten products; In the fourth part, China Tungsten online makes a superficial analysis on the future opportunities and possible tuyeres of China's tungsten

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products industry; The fifth part analyzes the advantages and disadvantages of China's large tungsten products enterprises; In the sixth part, we will analyze the difficulties and breakthrough ways of small and medium-sized tungsten products enterprises in China according to our own development experience and lessons and observations. This article is the last part of the series. In the future, we will continue to analyze and discuss new problems and market fluctuations. Due to the limited manpower and resources of China Tungsten Online, the content is inevitably biased and fallacious. Please give me your advice.



△Weak Position & Breakthrough of Small & Medium Enterprises in Market Game

1. Weak Position of Small & Medium-sized Enterprises in Market Game

According to the statistics of China Tungsten Industry Association, as of December 31, 2019, the association has 233 members, mainly distributed as follows:

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中国钨业协会分会名称	各分会会员单位数量/个	
地质矿山分会	76	钨矿山开采精选厂家
冶炼分会	39	在中间产品冶炼厂家
硬质合金分会	86	各类硬质合金制品生产厂
钨材分会	26	金属钨制品厂家
钨铁合金分会	4	钨铁合金厂
经贸研究分会	11	钨制品经营和出口厂

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△Members of China Tungsten Industry Association (CTIA)

In fact, in addition to the members who have joined the tungsten Association on a certain scale, there are still a large number of small and medium-sized tungsten products manufacturers in China. Taking Qinghe, Hebei Province as an example, by the end of 2018, the county has become the largest distribution center of waste cemented carbide and waste tungsten, molybdenum, nickel, titanium and other rare metals in China, with more than 50 enterprises above the production and operation standard, and the annual operating revenue has reached 2 billion Yuan. According to various online search data, such enterprises in China have gathered a large number of tungsten and molybdenum products processing and trading enterprises in Hunan, Jiangxi, Fujian, Henan and other places. It is preliminarily estimated that there should be more than 3000 enterprises engaged in the production and trading of tungsten and molybdenum related products in China, most of which belong to small, medium and micro enterprises.

Most of these enterprises have relatively backward production technology and low production efficiency, and some are still in the individual state of fighting alone. Except for enterprises with market competitive products and business characteristics, most of them are in the state of drifting with the tide in the market game, with low risk resistance and innovation, mainly due to insufficient capital strength and poor market bargaining power, There are many problems, such as the tightening and gradual implementation of environmental protection policies and labor protection policies, the rising cost of human resources, insufficient technical capacity, poor product innovation ability and adaptability, few marketing means and insufficient network marketing ability.

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2. Ways for Small & Medium-sized Enterprises to Breakthrough

According to the author's experience and observation in the marketing and network marketing of tungsten and molybdenum products industry for many years, I hope to dare to give our small, medium-sized and micro tungsten products enterprises some experience and suggestions, which may not be mature and applicable, and talk about throwing bricks to attract jade. Some suggestions given in this paper do not involve the well-known aspects of cost control, lean management and corporate culture construction.

2.1 Strive to Become the Invisible Champion of Tungsten Products

Large tungsten enterprises and listed companies have better financing channels. They have capital, human and technological advantages in new product R & D, technology and equipment transformation and upgrading, and also have the ability to build a product chain. Small, medium and micro enterprises cannot compete with them. They should accumulate existing product production technology according to their existing human and material resources, actively invest in the direction of individual products or individual products, carefully study the technical and market characteristics of individual products, and become the champion of individual products rather than seeking perfection. If there are too many product lines and product types, it will fall into the pressure of material preparation, production equipment, inventory and marketing personnel. Once the market is in a downturn, it is difficult to deal with the capital demand and cost burden in all aspects.

Invisible champion enterprises refer to those small and medium-sized enterprises that are not well known to the public, but occupy a leading position in a segment industry or market, have core competitiveness and clear strategy, and their products and services are difficult to surpass and imitate. Made in Germany is a well-known synonym for high quality. It accounts for about one third of the world's invisible champions. According to the data of the German government, there are about 1300 such "invisible champions" in Germany.

These invisible German champions believe in "good products speak for themselves" and occupy a leading position in the professional market segments. They are not eager to expand the scale, but emphasize staff skill training, widely listen to the opinions of all parties, and win the reputation of users with excellent quality; Many of them are small and medium-sized enterprises, which are privately owned. They believe in the principle of "stability first and speed second" in decision-making involving investment and development. Founded in 1925, the hydraulic cylinder and driving technology designed

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and produced by German Hansen company ranks among the top in the world. In 2018, it participated in the R & D of China's domestic large aircraft C919 together with its partners and provided testing services for wings and other components.

Referring to its experience, the general manager of the company believes that technical seminars are held almost every year or professionals are invited to conduct centralized training for employees, Improving the professional skills of employees is one of the factors, and as a small enterprise, they don't have to look at the stock price every day and worry about being maliciously acquired, but always focus on their own product quality and market demand is another decisive factor for their success.



△Hydraulic Cylinder of Hansen, Germany

There are also many unknown small workshop enterprises in Germany and Japan. They generally have no more than 100 employees, or even more than a dozen people, but many of them are invisible champions in the industry and have absolutely leading technologies in the world. Among them, Kimura production Institute, Kobayashi research industry, Hadlock Industry Co., Ltd. and Kitajima winch production Institute are the leaders. Kimura Manufacturing Institute has been engaged in the R & D and production of parts related to machine tools, industrial machinery and optical equipment, with only 40 employees. However, it is a supplier cooperating with large enterprises such as Mitsubishi Heavy Industry, Kawasaki heavy industry, Panasonic and Sumitomo technology, specializing in turning, milling, machining center, NC cutting, internal and external grinding, surface grinding Finishing one-stop parts processing and assembly; Kobayashi has a very powerful

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polishing technology.

With less than 10 employees, Kobayashi has polished 2.5 million Apple iPod mirror backplanes with strict process requirements in four years. The industry generally believes that in the polishing industry, almost no enterprise in the world can compare with Kobayashi; Hadlock Industry Co., Ltd., with only 45 employees and ultra precision aspheric machining, is the processor of "never loose nuts" used on the "Shinkansen" of Japan's high-speed railway; The spinning, stamping and special shape forming parts for plastic processing of various metal plates in Kitajima Shibori Seisakusho with only 20 employees are suppliers of special metal forming materials that not only rely on cutting-edge technology but also need manual process, such as Boeing aircraft, artificial earth satellite parts, Japanese H2 rocket top parts, etc, Their craftsmanship requirements are extremely strict. After ten years of honing, a qualified craftsman can judge the forming state from the sound of metal, and even the difference of 0.05mm can be judged from the senses.



△Never Loosen Nut， Hard Lock Industrial Co., Ltd, Japan

There are many things worth reflecting on: do we have clear blueprints and goals for employees, and do we share successful experiences and achievements? How many of our employees have worked in the company for 10 years or more? How many of our employees know the details of production technology? How many of our employees know the compactness of the product by looking at the sintered surface? How many of our employees can understand the metallographic diagram? How many of our employees have contributed to innovation?

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After investigating thousands of small, medium and micro enterprises and carefully studying nearly 20 typical representatives, Japan's summary of the basic quality of the enterprise community to cast an invisible champion is worthy of our reference and reference for small, medium and micro enterprises in the tungsten industry: enterprise managers give full play to their leadership ability and are good at collecting information, so as to adhere to an objective attitude and observe from the perspective of overlooking the world "Objective, historical, world, essential, on-the-spot and realistic" Analyze problems and make judgments, formulate business strategies, draw a new dream blueprint for all employees, adhere to business understanding and face turning points, the team maintains a high degree of sensitivity, takes unexpected and unfavorable changes as opportunities, makes decisions, makes gradual and steady changes, avoids the company from falling into chaos, adheres to the belief that cannot be changed, and takes the initiative to adapt to the new situation Change according to the situation, have a blueprint, not blindly pursue short-term turnover or profits, but clarify the business purpose of your company and the business philosophy of contributing to society and others.

Small and medium-sized tungsten products processing enterprises should find out their own professional strengths according to their accumulated experience and technology, carefully analyze and study the market demand and future changes, focus on their own professional fields and strengths, find out the gap between product coverage, product share and product advantages and disadvantages of large companies, fill the short board of large companies in the market and make use of the bureaucratic atmosphere of large companies With the characteristics of slow decision-making and long implementation chain, we use our own flat decision-making system to develop strengths and avoid weaknesses, strive for perfection in products, seek innovation and change in the market, increase our market demand and adaptability, respond flexibly to customer needs, actively study customer pain points, and design products and supply chain according to customer personalized needs.

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△Trend Chart of China's CPI & GDP

China's resident consumption accounts for only about 40% of GDP for a long time, while the United States accounts for more than 70%. With the resident consumption adjustment gradually provoked in China, this proportion has great room for growth. At present, China's human resource cost is still increasing. In the future, we will form a strong domestic market, realize the transformation and upgrading of resident consumption, as well as the transformation and upgrading of real business The upgrading of industrial structure will also drive the overall consumption transformation of countries in China's surrounding regions. During this period, there will be a lot of market opportunities and challenges. For example, in some developed countries in the west, due to the high cost of human resources, many households' maintenance and other work are mostly completed by themselves, which has created a large household tool set market.

With the cost of human resources in China The continuous improvement of will also enter such a stage, which will give us a huge market for domestic cemented carbide tool sets, which is a great opportunity for many small, medium-sized and micro enterprises of tungsten products in China in the future; at the same time, with the construction tide of China's general airport in all provinces, regions and cities across the country, the number of small and medium-sized general aircraft in China will usher in a huge growth, so as to It

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is bound to drive the blowout of demand for tungsten alloy rivet ejector rod for aircraft maintenance in China. Therefore, how to formulate accurate strategy, find the market, stick to specialty and move with the market will be the decisive factor for the survival and growth of small and medium-sized tungsten products enterprises.



△Tungsten Cemented Carbide Cutter & Tools, CTIA, China

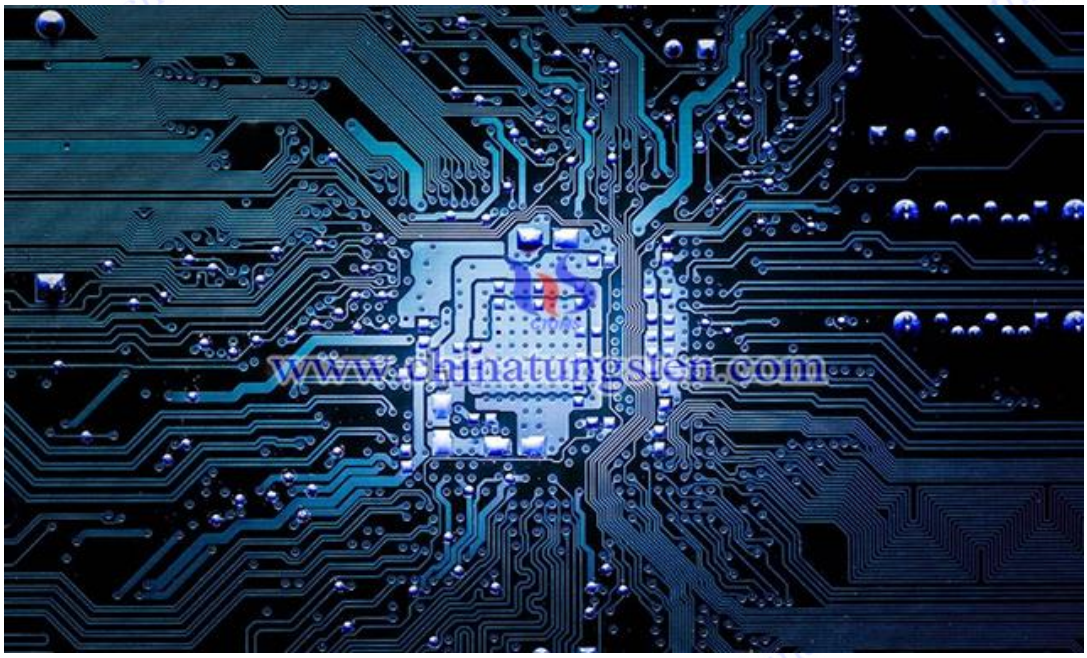
Most large tungsten products enterprises are listed companies, which will be limited and affected by many laws and regulations at home and abroad. For example, when designing dual-use technologies and products, many companies may not be able to carry out R & D and production and manufacturing, while small and medium-sized tungsten products enterprises are non-public listed companies, and enterprise data and products are only controlled by themselves and do not need to be made public, which gives small and medium-sized tungsten products enterprises the opportunity to participate in China For the R & D opportunities of many sensitive technologies and products in China, we can find areas where large enterprises have not been involved, have no willingness to invest, or are limited to the development of market balance and regulation at home and abroad, such as aerospace, military industry, 5G, high-speed rail, electronics, chips and many other fields restricted by Europe and America. We can find a unique way in product R & D and obtain the effect of winding roads and secluded roads.

In the future, China's new infrastructure including 6G will gradually develop, new energy including new nuclear energy will be continuously developed and invested, and new transportation infrastructure including maglev train will also bring new social and

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industrial changes. Therefore, our small and medium-sized micro tungsten products enterprises should seize the opportunity to devote themselves to it and gradually become the focus of products or applications in various subdivided fields of tungsten products "Invisible champion", which will improve the overall manufacturing level of China's tungsten industry, create the brilliance of China's tungsten industry, and achieve the bright prospect of the enterprise itself.



△Chips, Which Consumes a Lot of Tungsten Cemented Carbide Micro Drill

2.2 How to Become the Invisible Champion of Tungsten Products Industry

(A) Focus on Industrial Frontier & Edge Products

According to its many years of market research experience, China Tungsten online believes that in order to survive and develop, small, medium-sized and micro enterprises do not blindly expand production and sales like large enterprises, especially in mature products and markets, nor can they compete with large tungsten products enterprises. Such an example has been clearly seen in tungsten intermediate products, and has been expanding and rising in several large enterprises After the first-class tungsten chemical smelting production line, small, medium-sized and micro enterprises have no advantages in scientific research in the production of tungsten oxide products, and have no cost and price competitiveness in the market. At the same time, small, medium-sized and micro tungsten products enterprises can not adopt the sales method of exhibition and setting up points by region like large enterprises in the market, because small and micro enterprises

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have high popularity, customer service cost and There is still a gap with large enterprises in technical capacity.

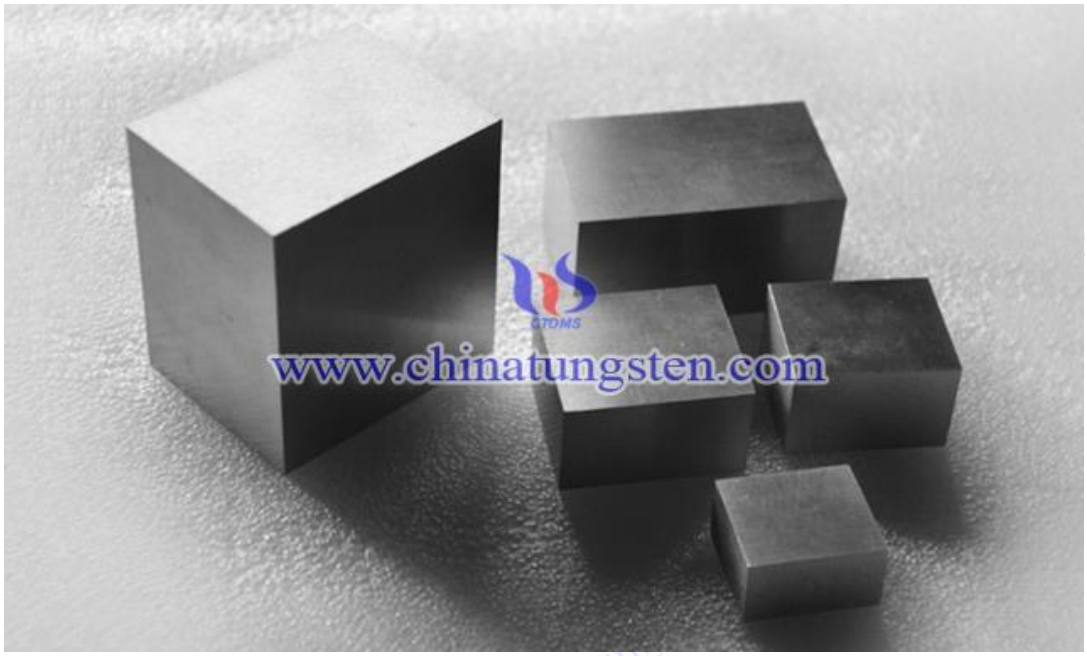
Small, medium-sized and micro enterprises should carefully study the current market pattern, future economic and consumption trends, and actively look for marginal products in the current market. Such products are often market needs that cannot be met by the production lines of large companies, such as some industries (medical treatment, art, food and agriculture) Urgently needed special cemented carbide cutting tools, molds and tool parts; or closely track the latest development technology and edge applications in relevant industries (such as the application research of tungsten chemicals in building materials, paint pigments and new energy power generation and storage) , as well as the new fields and trends of the use of existing products in the market, the problems and bottlenecks encountered by existing products in the market, and the market adaptability and personalized needs of their own products.

(B) Pay Attention to the Research Direction of Scientific Research Institutions

Tracking the latest research results and technology development trends of universities and scientific research institutions, actively looking for application prospects in cross science and cross fields, and the latest patent application trends and materials may bring new ideas and horizons to enterprises, as well as external technical resources and the direction of new products. At the same time, we think we should also pay attention to the research and application of relevant cross science and technology. In the field of chemical products, we should pay attention to the research trend of photovoltaic industry application and the application of special tungsten oxide in this field, because the production line of large tungsten product smelting enterprises can not meet such special applications in the so-called niche market in terms of cost and equipment, In terms of new energy batteries, attention should be paid to the latest application technology research and market development of tungsten oxide products in the battery field, especially the possibility of rapid growth of Purple Tungsten in the future. We also note that there are overlapping, substitution and interworking markets and processing technologies in metal tungsten, high specific gravity tungsten alloy, tungsten copper alloy, cemented carbide machined products and other metal or non-technical products, such as molybdenum alloy, titanium alloy and ceramic materials. We need to pay close attention to the market and technology of tungsten products, Pay attention to the research progress and competitive research of relevant materials, so as to learn from the processing technology and market application of other products, so as to better develop ideas and expand the market.

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△High Specific Gravity Tungsten Alloy Cubes/Block/Bricks

On the other hand, if small, medium-sized and micro enterprises invest in patents and technology R & D by themselves, they need to invest a lot of human and material resources and have certain technology accumulation and experience. Their own R & D investment may not be effective. We have also seen some patents and related technologies developed by enterprises themselves, some may be patents for patents and patents developed to apply for high-tech enterprises, in fact, it may not be applicable and effective. Therefore, small, medium-sized and micro enterprises can use external forces to cooperate with colleges and universities, or purchase patents that are practical for their own enterprises, or entrust research and development of patents or proprietary technologies needed by their own market through commercial cooperation. This may be a practical and low-risk way.

(C) Focus on Market R & D Investment

Almost all enterprises have product R & D departments, large or small. Large enterprises, such as Xiamen tungsten industry, have their own research institutes, post doctoral mobile stations in one or more directions and other technology and product R & D institutions. Many enterprises have established good cooperative relations with universities and scientific research institutions, this has precipitated and accumulated a large number of technical and human resources, and its cost is unimaginable for small and medium-sized tungsten products production and processing enterprises. There is no problem in paying attention to technology and product R & D, but it is a big problem of cost and manpower

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for small, medium-sized and micro enterprises. On the contrary, few enterprises have set up special market R & D departments, and few have special market R & D teams and human resource allocation. This is true of large enterprises, especially small and medium-sized enterprises. Most of their bosses or enterprise managers are the market orientation of enterprises, and their starting point is likely to be their own experience, experience and observation, there is no strict, detailed and long-term market research and development and data support.

We believe that market research and development is not only market research or market research, but also forward-looking research and judgment by personnel with relevant technical and market background who have a deep understanding of the future niche market development and trend of the market and products, the pain points of the current market and products, and the strengths and weaknesses of the enterprise, A team that can propose products and marketing solutions according to the changes of relevant factors.



△Tungsten Products Marketing & Promoting

2.3 How to Conduct Market Research & Development

(A) Increase Marketing R & D Investment

Among the enterprises we know, many have a large proportion of human and material resources investment in technology R & D, but little or no corresponding budget in market research and research. We believe that as an enterprise, finding the right market entry

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point and product blue ocean is the source of all work and the leader of technical research and production. Without accurate market direction or wrong product direction and positioning, technology R & D investment is a huge waste of time and physics, and will also lose the opportunity to occupy the market, Therefore, any technical research should be determined on the basis of market research. The investment in market R & D is an important basic preparation for enterprise sales promotion.

(B) Focus on Market & User Portrait

First of all, a full understanding of the market is the primary link in our market research and development. Without understanding the current market hot spots, difficulties and pain points, we can't grasp the current mature products and products that have passed the rising period, and we can't avoid the shrinking market; It is also impossible to understand the scarcest products in the current market and the difficulties and problems encountered in practical application. Solving the difficulties and problems in these markets may be the breakthrough and technical improvement points needed for our production. On the other hand, we also need to pass the development law of the existing market, the trend of economic development and the future market product and technology pattern, The possible new applications and products, new fields and new trends of tungsten products, the market adaptability and individual needs of tungsten products in the future, make our basic data and basic knowledge accumulation stage of market research and development.



△Tungsten Alloy Rivet Ejector Bucking Bar

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Understanding the market refers to the domestic and international regional markets of tungsten products, as well as different markets in traditional and new fields. Market R & D personnel and teams should find market directions and problems from existing customer procurement behavior, market application fields and data, or study market trends and needs from unknown markets and customers, Market research can more and more clearly describe the domestic and foreign markets, traditional and emerging markets, existing customer application fields, possible blue ocean of the future market and other aspects of their products, and constantly adjust and follow up market development plans and behaviors according to market dynamics, so as to consolidate the existing market and develop emerging markets.

The market R & D team of an enterprise should not only pay attention to and rely on the information of the tungsten product market to carry out active R & D, but also accurately portray the direct users and consumers of its own products, or more generally, clearly understand and describe the users. These understandings come not only from the traditional experience summary of "Spring River water heating duck prophet", It should also come from all aspects of sales details and customer feedback, accurate cognition and accurate analysis of customer behavior; The customer portraits of tungsten products enterprises are different from general consumer goods. In addition to a small number of direct consumers, such as tungsten alloy handicrafts, tungsten steel rings, tungsten alloy aircraft maintenance rivet tools, tungsten electrodes, etc., most enterprise customers are bulk purchasing users. Therefore, the data system is used in time to analyze the purchase data, purchase time, purchase order quantity, purchase type, payment behavior Research on customer behavior habits and customer market preferences such as social and cultural background of customer market, online sales and promotion behavior, local economic development and national economic characteristics; At the same time, we should also study the customer's region and the customer's own network behavior, such as local search engine, mainstream language and local network technology, and find out the customer's preferences and the sales characteristics and behavior of competitors.

Accurate and detailed user portrait of tungsten products is an important part of market research and development. On this basis, enterprises can accurately grasp the market trend, accurately understand the actual needs and changes of customers, and point out the direction for the future production and sales plan of enterprises. Therefore, accurate customer portrait and customer application scene portrait are the most important part of market research and development. Different from the customer satisfaction survey, the market portrait is relatively forward-looking and predictive. The customer survey focuses on the work of after-sales service, and the customer feedback determines the quality of data collection and information, so it is relatively passive.

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The data and relevant information obtained by enterprises on the basis of market research and development can be well combined with the data of customer management system, combined with and linked with the enterprise's sales, planning, design and production system, so as to build their own customer and market management system with AI function for enterprises and obtain the output results of market research and development, And it can lay a data foundation for enterprises to build intelligent manufacturing - intelligent manufacturing.

2.4 Strengthen Network Marketing Ability

Most tungsten products enterprises have their own production characteristics, know-how and market. However, in the tide of network economy, most of the contact and promotion of external markets are also concentrated in traditional market influence means. Few enterprises with strong production capacity and good at network global marketing are also the main work of China Tungsten online, That is, integrate the production capacity and technology of tungsten products industry, use the marketing ability of network platform, gradually cultivate the flexible manufacturing ability to meet the market demand of customized tungsten products, cultivate and develop the tungsten products market, and actively participate in the international tungsten products market competition.



△E-Commercial of Tungsten Products

(A) Pay Attention to Network Platform Marketing & Go to Sea by Other Ones' Boat

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In the field of traditional marketing, many small and micro enterprises of tungsten products in China have little chance to win, or even have a fair chance to compete with large tungsten products enterprises, because small and micro enterprises do not get a fair opportunity in national regulation, or even do not have enough funds to participate in various exhibitions and seminars that consume a lot of human and material resources, Therefore, according to their own characteristics, small and medium-sized tungsten products enterprises can at least do the following in terms of online marketing:

(a) Open their own accounts on major network platforms, such as Alibaba, Amazon and Taobao, shorten the distance and time between enterprises and media and networks with the help of the platform, narrow the gap with the original advantages of large tungsten products enterprises, and achieve the purpose of selling their own products and promoting popularity;

(b) Tik Tok, a new force suddenly rises. In the past few years, Kwai tat, IG and other social media platforms such as Facebook, twitter, and IG have been trying to show their characteristics and characteristics. In recent years, the sudden shaking of voice, fast hand and other audio and video websites can also become an effective channel for the dissemination and diffusion of the content of the enterprise's self-made content. In recent years, our circle of friends has seen more and more information about tungsten and molybdenum products growing rapidly, which shows the positive actions and attempts of relevant enterprises on the social media platform. The essence of social media marketing is the relationship between people. It is also an informal relationship between enterprises and customers. Delivering value through users is one of the important functions of social media.

At the same time, enterprise websites or social media accounts are also very important traffic sources. Worldwide, people use all kinds of media software to communicate and share with each other. Enterprises should gather all kinds of similar groups to continuously achieve the purpose of network marketing. Of course, any enterprise in social media and community marketing needs to accurately locate the customer base according to its own product characteristics, do a good job in the daily interaction and communication of the community, increase the exposure of the community platform, expand the drainage and fission of the community, cultivate loyal fans, and finally become friends with customers in the social circle, so as to promote the popularity and marketing of the enterprise simultaneously.

(c) Use the online recruitment platform to actively establish their own brand and image, expand the recruitment objects and scope of human resources, and actively strive for the opportunities and possibilities of obtaining high-quality human resources. The flexibility

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and humanization of human resources policies may also be another comparative advantage of small and medium-sized tungsten products enterprises;

(d) Actively use the sharing function of important network platforms and blog accounts to introduce the company's business and products. Sina blog and Google Blog are good marketing tools at home and abroad, especially Google Blog can have a good performance and ranking in Google search.

(e) Online advertising. Although online advertising is becoming more and more expensive, after all, when websites and platforms among enterprises fail to achieve certain results in the short term, they should invest appropriate funds, cooperate with their own marketing strategies, use some well-known portal websites and famous search engines, adopt CPS advertising, and control costs and target customer groups and regions to launch online advertising, it is also a good short-term effective marketing tool.

(f) Search engine optimization and marketing. China Tungsten Online Technology Co., Ltd. is the first e-commerce company of tungsten products in China. Since the construction of its first website in 1997, it has accumulated many years of search engine optimization and marketing experience. After experiencing the mass sending of spam information and other means, the final precipitation of network marketing is still search engine optimization and other tools, which are more stable and effective. According to the experience of China Tungsten online, more than 90% of our customers find us and establish business relations through the keywords of search engines. From a long time and stability point of view, the conversion rate of search engine traffic is much higher than other network tools, and the effect is relatively stable. SEM for the lack of keyword ranking in the early stage of the establishment of the station, although the cost is high, the effect is also fast; SEO needs more manpower, slow effect, long cycle, less relative cost, good and lasting marketing effect.

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△Platform for Collaborative Design, Flexible Manufacturing, Intelligent Logistics, etc.

(B) Building Sales Platform & Creating Independent Network Marketing Ability

At present, with the rapid development of network technology and the leading data and traffic of major platforms, small, medium-sized and micro enterprises and even large tungsten products enterprises may face the penetration of large platforms into professional fields at any time. In order to prevent large platforms from going deeper into the integration and vertical dimensionality reduction of industries and professional fields, It is an essential strategic layout for enterprises to build their own websites and social media ecological groups. Otherwise, even the leading enterprises in the tungsten industry may be difficult to resist the impact of AI design, intelligent production and intelligent supply chain revolution based on massive data and cloud computing platform.

Enterprises can build their own websites or platforms, build their own independent station groups, or build station groups with the help of third-party professional institutions, or cooperate with their own upstream and downstream of the industrial chain and relevant partners of the supply chain. Whether self built websites and social media, or cooperative construction of network marketing stations, the main work and precautions are: website optimization is the preliminary work of website construction and always implemented. Website construction pays attention to hierarchy and optimization framework, daily website management, timely update, maintenance and website drainage, and pays attention to statistics and analysis according to the data of website readers, Pay attention to the construction and adjustment of diversified web pages for service objects,

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long-term adhere to the rule of content, concise presentation form, pay attention to copyright and legal issues, timely track and adjust software and hardware, and keep up with the trend of the network era and the development of website technology.



△Site of CTIA Co., Ltd (China Tungsten Intelligence Alliance) www.ctia.com.cn

(C) WeChat and others of Mobile APP

After human society entered the 4G era, the network transmission speed and quality have been rapidly improved and increased. We have basically entered the 5G era and have seen the dawn of quantum computing and 6G. Under the space-time background of the rapid development of IT technology, all kinds of information have filled every corner of our life. People have more and more fragmented time. Mobile phones are a part of our life, it has even become a part of our body. Clients with mobile phones and other mobile terminals as the main carrier occupy more and more of our time. We have more and more ways and opportunities to communicate and communicate with mobile communication tools. Our small and medium-sized micro tungsten products enterprises have better low-cost, high-density all-weather contact with customers and increase user stickiness, you can build your own mobile app customers or use existing social media platforms, such as WeChat and other applets to build your own information and product dissemination clients, which is also a great opportunity for small and micro enterprises to rely on external forces. Applets can enable small and micro enterprises to avoid the advantages of large capital investment of large enterprises and build a gold lettered signboard with smart phones as the carrier.

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2.5 Keep Learning with the Help of the External Brain

Facing the flood of all-dimensional information after the information explosion, marketing is no longer in the dark box of information asymmetry. In the future, marketing will move from individual sales to team sales, from one-time sales service to lifelong service, from experienced special forces sales to standardized and professional business process sales, and from expanding the number of customers to improving customer quality, from star sales to personalized customization cooperation and sharing sales cooperation. This requires us to first select the marketing model suitable for the enterprise, and then decompose the marketing process of the enterprise, so as to create an iron army of sales. Most small, medium-sized and micro enterprises of tungsten products focus on the production and technology research and development of certain products and fields, but they may not have expertise in the creation of market and professional marketing team. Therefore, they can use external forces or internal resources to let the production personnel learn market knowledge and customer feelings, and let the marketing personnel learn and understand the professional technology of product design and production, Let managers learn how to be employees, customers and markets, make production, operation and marketing more professional and technical with the help of external forces, and become professional production technicians and professional sales engineers.

During many years of contact and cooperation with domestic suppliers and customers offline, the most profound feeling is that the production technicians of most small and medium-sized micro tungsten products enterprises in China do not understand the needs and feelings of customers, the supply rhythm and risks of the market; At the same time, marketing personnel can not design and production technology, and it is difficult to accurately convey the enterprise's product expertise and professional ability to customers. Such a production and marketing combination is difficult to cope with the changing market and personalized customer needs.

2.6 Horizontal Integration of Tungsten Industry Chain

China's small and medium-sized tungsten products enterprises have their own strengths and inevitable weaknesses. How to combine vertically and horizontally, learn from each other's strengths in the industrial chain, report to the group for warmth, and strive for better prospects and greater living space is not only a strategic thinking based on the benign development of the industrial chain, but also an inevitable strategic choice. Drawing on the modular concept, enterprises in relevant industrial chains should be independent and integrated with each other, form a modular concept, reorganize production capacity into different modules, integrate their respective advantages of

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resources, production capacity, technology, manpower and equipment on the basis of the organizational structure and intelligent software of flexible manufacturing and intelligent manufacturing, make up for their respective disadvantages, and fight in groups at sea as a whole. Only in this way can we meet greater storms, overcome greater difficulties, develop strengths and avoid weaknesses, and achieve local advantages for more years.

For example, tungsten carbide powder production capacity + external mold manufacturing + pressing equipment + sintering equipment + external machining capacity + customer acquisition advantage in the market, all capacities in this link can be internal or external, either a fixed combination or a temporary combination based on task and benefit distribution. Taking the actual integration ability of China Tungsten online as an example, we once received shield orders from internationally famous large companies, but our own ability is not enough to complete the document delivery independently. After that, China Tungsten online integrates the respective advantages of relevant enterprises, purchases advantageous powder with its own funds and provides it to pressing manufacturers, and then gives it to cooperative plants with large sintering equipment, after sintering, the rough embryos are handed over to manufacturers outside the tungsten industry chain with strong mechanical precision work ability for fine processing before delivery. The implementation of such contracts can be completed only by integrating the respective strengths and equipment capacity of each manufacturer. It is difficult for an enterprise to complete on the basis of existing capacity, and it is difficult to bear the corresponding possible losses.

The closest product enterprises in the industrial chain or completely different enterprises that change products far away, and all kinds of complementary, exclusive or symbiotic enterprises in the industrial chain should cooperate with each other to build and cultivate their own micro supply chain and ecosystem, and make use of their respective advantages to complement each other, coexist and prosper.

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△Searching Tungsten Customer Resource & Integrating

2.7 Making Use of Domestic Experience & Technology to Go to Sea of Global Market

According to the statistics of China Tungsten Association, Japan, South Korea, Europe and the United States are the four major destinations for China's Tungsten exports. In 2020, the volume of tungsten exports to the above regions decreased by 38.65%, 0.93%, 27.07% and 37.11% respectively, compared with the previous year. The global economic downturn has had a greater negative impact on China's exports of tungsten. This phenomenon reflects the great impact of COVID-19 exports on tungsten products.

On the other hand, it also reflects that China's tungsten products export items are increasingly extending to deep-processing products. Over the same period, China imported 3793.92 tons of tungsten products (excluding cemented carbide equivalent metal), with a year-on-year increase of 43.36%, including 1633.50 tons of tungsten concentrate, with a year-on-year increase of 11.48%, accounting for 43.06% of the total import, accounting for a decrease of 13.31 percentage points compared with the previous year, continuing the downward trend; 624.04 tons of sodium tungstate were imported, with a year-on-year increase of 3.69% and continued growth; 704.45 tons of calcium tungstate were imported, with a year-on-year increase of 50.19%; As China prohibits the import of tungsten waste, domestic enterprises build waste tungsten recycling production lines in Southeast Asia, and some tungsten containing waste is transformed into sodium tungstate or calcium tungstate and imported into China.

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According to the above analysis of the current situation of tungsten products trade, and with the implementation of the national list of hazardous wastes (2021 version) from January 1, 2021, the alkali boiling slag (tungsten slag) produced by alkali decomposition in the production of ammonium paratungstate, molybdenum removal slag and wastewater treatment sludge produced in the process of molybdenum removal are listed as hazardous solid wastes, which makes China's small and medium-sized micro tungsten products processing enterprises face great pressure on environmental protection.

At the same time, the cost of human resources in China is increasing year by year, and the cost of various raw materials is still high. In this case, Chinese enterprises should actively go abroad and build overseas production and processing bases by taking advantage of the technological accumulation in Tungsten Product mining, smelting, production and processing, waste and scrap recycling, processing and utilization and the advantages of the huge domestic market, On the one hand, we can use the existing domestic professional technology, equipment and personnel to transfer part of the production capacity and avoid adverse factors such as domestic environmental protection, and export some tungsten products processed abroad as raw materials to China.

On the other hand, we can also make our products closer to the market, which is conducive to the expansion of the sales market. In particular, it is more favorable for the production and marketing of cemented carbide in Southeast Asia. Tungsten ore and other raw materials produced by some Southeast Asian countries can also be used for on-site processing, so as to reduce import and export control and dependence on domestic raw materials.

At present, with the sharp rise in the price of tungsten products and the increasing shortage of raw materials, it is a strategic layout for small, medium-sized and micro enterprises in disadvantageous positions such as production and processing in China.

END OF THE PART VI OF VII OF THIS PAPER.
THE 7TH PART OF THIS PAPER IS BASIC ANALYSIS OF SUBSEQUENT SUPPORT FOR THE PRICES OF TUGNSTEN'S RISING.

(to be continued)

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MARKET & PRICE TREND OF TUNGSTEN

CHINA, 2021

PART VII of VII

Analysis of Subsequent Support for the Price of Tungsten's Rising

Since June this year, the price of tungsten products has continuously increased to about 15%, of which the price of tungsten concentrate has increased from RMB98,000 Yuan per ton to RMB114,000 Yuan per ton, an increase of 16.3%; The price of APT increased from RMB147,000 Yuan per ton to RMB 170,000 Yuan per ton an increase of 15.6%; The price of tungsten powder increased from RMB230 per kg to RMB260 per kg, an increase of 13.9%.

With several domestic leading enterprises with great influence in tungsten concentrate resources in tungsten industry, such as Xiamen Tungsten, Jiangxi Tungsten, Zhangyuan Tungsten and Xianglu Tungsten, the price of raw materials will remain high, and the price of tungsten products will remain at the current high level in the short term; Although the market has some fear of the current price, it is generally believed that the price of tungsten products will repeat the cycle of sharp rise and fall in the past. This is not a special case of the tungsten products market. All market emotions will have the game psychology of both long and short after the price rise, as is the case in the physical market, futures trading and stock market.

After analyzing the macro and meso economic trends, political and economic patterns, fiscal and financial policies and other factors at home and abroad, China Tungsten Online holds the opposite view on the analysis that the price of tungsten products in the industry will fall sharply. The author believes that the price of tungsten products will not fall sharply after this round of price rise, and will remain high for a long time, after that, there will be a greater possibility of rise. After the periodic rise, it will fall slightly from the first wave high in the early-stage next year and maintain the price as the normal market price.

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△Price Trend Chart of China's Tungsten Markets from Jan. to Aug. 2021

In late June 2021, China Tungsten Online made the first prediction for the current price rise of tungsten products, and made a deep analysis of the factors that made the rise. The relevant contents can be seen in the serial articles issued by the "Zhong Wei Online" official account. The 2021 market and price trend of tungsten products are restricted. As a follow-up development of the price rise, this paper intends to discuss the important support after the price rise of China's tungsten products in the second half of 2021, that is, the impact of the upcoming large-scale infrastructure wave in China, the United States and India on the tungsten products industry, clarify the market trend after the price rise of tungsten products, and boost the confidence in the price of tungsten products.

The basic logic of this paper is: on the one hand, from the consumer side, the consumption of tungsten products mainly comes from the consumption of industrial production and infrastructure construction, and the price of tungsten products is anchored to the difference between market supply and consumption, that is, the scarcity of tungsten products; Infrastructure construction will not only consume a lot of tungsten products such as cemented carbide, but also drive the demand for tungsten products in surrounding industries of steel, cement, glass and other building materials.

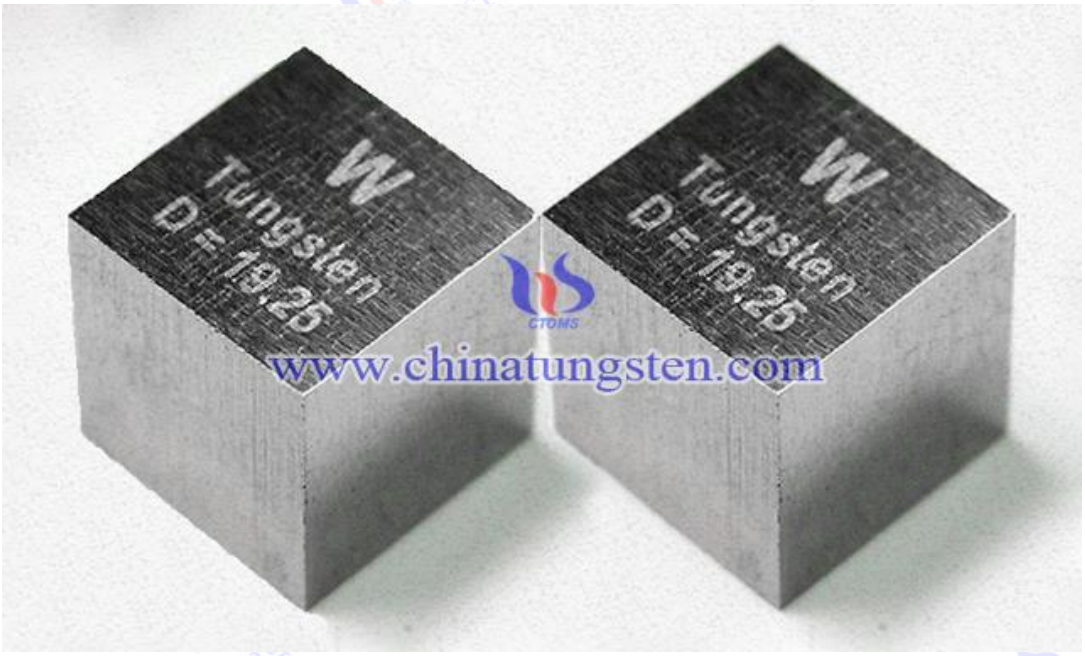
On the other hand, from the perspective of tungsten products industry chain, the demand for cemented carbide consumption, which accounts for the largest proportion of tungsten end consumer goods, increased due to the expansion of infrastructure investment, thus increasing the procurement of tungsten powder and tungsten carbide powder. The

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demand for powder pushed up the market consumption of tungsten chemicals, eventually leading to the flexible production and sales of raw materials such as tungsten concentrate and waste tungsten and maintaining high prices. Therefore, the focus of this paper is not the consumption trend of the industrial chain of tungsten products themselves, but the planning and investment trend of infrastructure investment in major economies in the world such as China, the United States and India in the future, so as to deduce that the price rise of tungsten products is not only due to market scarcity and the overall rise of material prices, The more firm and long-term supporting factor will be the demand for infrastructure construction.



△Tungsten Metal Cube

1. Strong Growth of China's Infrastructure Demand for Tungsten Products

Generally speaking, infrastructure construction investment includes (1) traditional infrastructure construction, such as road transportation, municipal public facilities, power and heat investment, etc. (2) on the other hand, it also includes new infrastructure advocated in recent years, such as information infrastructure (5G, industrial Internet, Artificial Intelligence(AI), Augmented Reality(AR), Virtual Reality(VR), innovative infrastructure, such as the rise of industrial parks in various regions, (3) Meanwhile, we believe that the construction of smart city, technology city (future city), garden city, tourism and healthy City will be a new part of the comprehensive infrastructure, (4) the 2020-2021 year's continuous impact on COVID-19 will lead us to build up the public health software and hardware. For example, professional facilities such as medical

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institutions, emergency rescue and isolation treatment put forward higher requirements and faster construction speed, (5) after the great challenge of sudden natural disaster weather in Zhengzhou and other places in 2021, our infrastructure construction for urban and rural response to floods and other natural disasters will also become an important part of infrastructure construction, (6) in order to cope with the "Digital Dark Era", Such as the infrastructure construction of new energy vehicle charging station, communication facilities, general airport and emergency land and air transportation, as well as (7) the infrastructure construction of health, public health, sports and leisure in order to build a "Healthy China", and (8) the financial transfer payment and its landing project construction in order to achieve fair distribution and common prosperity.

Infrastructure is basically dominated by the government. Due to its large investment scale, long cycle and low return, it often becomes the main means for the government to reverse regulate the economy and underpin the economic downturn. So, is there any pressure and demand to regulate economic growth and underpin the economic downturn in China?



△The Related between GDP of China and the Price of Tungsten

The International Monetary Fund released the latest GDP growth rate of 8.1%, down 0.3% from the agency's previous forecast. Meanwhile, Goldman Sachs, JPMorgan Chase and Morgan Stanley lowered their GDP growth forecast for the third quarter from 4.3% to 2.0%, and the GDP growth forecast for the whole year from 9.1% to 8.9%, while the Chinese government's GDP forecast at the beginning of the year was about 6% relatively conservative. The IMF's latest forecast for the growth rate of US GDP this year will reach

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7%, up 0.6% from the previous forecast of 6.2%. Through in-depth study of the reasons, from January to July 2021, the indicators of China's traditional "troika" driving economic growth are: investment increased by 10.3% year-on-year, with an average increase of 4.3% in two years; The total retail sales of social consumer goods increased by 20.7% year-on-year, with an average growth of 4.3% in the two years; The total import and export volume of goods increased by 24.5% year-on-year, with an average increase of 10.6% in the two years. These data show that the three indicators remain basically stable, only the import and export growth is rapid, and the overall trend is high in the first and low in the second; China's GDP grew by an average of 5.3% in the first half of the year, only 0.3 percentage points faster than that in the first quarter.

Apart from the stability of consumption, import and export, and the sluggish recovery of residents' consumption due to the emerging epidemic, the only thing that can significantly drive China's strong economic growth is infrastructure construction.

According to the general law, in the first year of each five-year plan, the central and provincial and local governments will promote some major projects one after another. This year is the first year of the implementation of China's 14th Five-Year-Plan. The construction of various industrial, agricultural and social infrastructure is imperative. Compared with the previous Five-Year-Pans, it is more urgent and requires more and larger infrastructure investment.

1.1 Reason: The Decline of Real Estate Makes Infrastructure the Main Tone of Investment

As the main investment option, the real estate market has been operating under the policy of no speculation in housing for more than two years. Various policies and measures to control house prices have been increasing in the near future. The main indicators of urban house prices and transaction volume represented by Shenzhen have decreased and shrunk significantly in varying degrees. In the medium and short term, the state will still strictly control real estate investment and house price speculation.

On July 30, the meeting of the Political Bureau of the CPC Central Committee continued to emphasize that "we should adhere to the positioning that houses are used for living rather than speculation, stabilize land prices, house prices and expectations, promote the steady and healthy development of the real estate market, accelerate the development of rental housing, and implement practical land, tax and other support policies". In May, the growth rate of residents' medium and long-term loans also began to decline. In June, the completed amount of real estate development investment was 1.79 trillion Yuan, with a year-on-year growth rate of 5.9%, falling for three consecutive months. In July, the sales

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area of commercial housing in 30 large and medium-sized cities was 17.16 million square meters, down 83000 square meters compared with the previous month, down 14.30% month on month. More than 80% of cities decreased in varying degrees, down 4.29% year-on-year, The transaction area of the four first tier cities fell month on month, of which Shanghai fell by more than 30% and Beijing by more than 15%.

On the other hand, in the past thirty years, infrastructure construction has provided a powerful impetus for the rapid economic growth of our country. The construction of the relatively advanced infrastructure, roads, bridges, port airports and high-speed rail has provided a strong guarantee for the balanced development of China's economy, and for the effective operation of COVID-19 and the effective supply of the supply chain and the economic viability. Therefore, the political and business circles generally believe that China's infrastructure investment in the second half of the year will be the best choice to maintain stable and rapid economic growth.

表：2021 年 7 月主要城市房地产市场交易情况

城市	成交套数 (套)	成交面积 (万㎡)	成交面积 环比	成交面积 同比
北京	8700	102.87	-15.45%	53.77%
上海	14527	147.74	-30.86%	9.36%
广州	7560	81.19	-11.50%	-17.26%
深圳	2712	26.41	-6.70%	-22.95%
一线城市	33499	358.22	-21%	7%

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△Real Estate Transactions in Major Cities of China in July 2021

1.2 Demand: The Necessity of a New Wave of Infrastructure Investment

(A) Demand for Short-term Policies to Support the Bottom and Maintain Stability

From 2020 to 2021, except that China's import and export will maintain rapid growth driven by the housing economy such as epidemic prevention materials, consumption and investment are not ideal. The central government determined a GDP growth plan of about 6% at the beginning of the year. It can be seen that the central government has an accurate judgment on the basic economic operation trend of this year. Therefore, we can infer that

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the state will timely launch a relatively positive fiscal policy in the second half of 2021, to ensure the basic stability and sustainable development of the national economy under the situation of strictly controlling the overheating of real estate. 7.30 the Politburo meeting stressed that the proactive fiscal policy should improve policy efficiency, hold the bottom line of "Three Guarantees" at the grass-roots level, reasonably grasp the progress of investment in the budget and the issuance of local government bonds, and promote the formation of physical workload at the end of this year and the beginning of next year. It should be a positive signal to vigorously promote the rapid promotion of infrastructure construction in the second half of the year, which can be predicted, Our Congress will withdraw from comprehensive measures such as finance and investment to ensure economic development in the near future.

(B) Rural Urbanization and Social Modernization

As of 2019, there is still a gap of more than 10 years between China's urbanization rate of 61% and that of Japan, the United States and major European developed countries. Urbanization will not only release a large number of rural labor force into industrial production and become a reliable human resource guarantee, but also continuously develop and upgrade China's agricultural intensification and industrialization; At the same time, rural urbanization will also make centralized and effective use of scarce resources such as education, medical treatment, heating and sanitation in China's vast rural areas, balance the gap between urban and rural modernization, improve the overall modernization of society, and realize a more equitable distribution and sharing of social wealth and resources, It also provides a material basis for the smooth realization of China's carbon neutralization goal of energy conservation and carbon reduction in 2060. China's vast rural urbanization and modernization process will greatly promote the demand and construction of economic and social infrastructure.

(C) One Belt, One Road Infrastructure Needs

One Belt, One Road, has been tested since 2020. COVID-19 has demonstrated the foresight, necessity and urgency of the construction of the whole area. In terms of sea and air transportation, a large number of China's export goods have encountered unprecedented sea transportation congestion and a ten-fold increase in freight rates. Air transportation has encountered a series of problems, such as limited transport capacity, insufficient routes, limited airport handling capacity and high freight rates, and the sea and air will be affected by geopolitical and social risks at any time One Belt, One Road port, will be built up and expanded in the future.

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△Infrastructure Construction

Recently, the situation in Afghanistan in the southeast of China has taken a sharp turn for the worse and has become predictably stable. The obvious friendly policy towards China of the new Afghan government will give China the opportunity to participate in reconstruction, alleviate the security pressure on China Pakistan Economic Corridor, and improve the value of the port in Guadar, Balochistan province, Pakistan, Therefore, China is expected to take advantage of the favorable opportunity of Afghanistan's reconstruction and economic recovery to expand and expand the construction of China Pakistan Economic Corridor.

China's One Belt, One Road, will probably follow the Central Asian and the Middle East across the Suez Canal in Egypt, and link the Tanzania Railway - the Mombasa-Nairobi Railway and the Dapilon-Santou Railway to the world's largest iron ore in the Republic of Guinea, (La République de Guinée) which is opened by China's Compnaies, and then directly link the copper, iron, and land through the land route. The withdrawal of the United States is scheduled to withdraw from Syria and withdraw from Liberia. One Belt, One Road, is not a dream. So, the near future and the whole area of infrastructure construction will not only promote the development of various industries in China, but also bring rich resources to our country.

To the south, under the background that Malacca is controlled by the United States and the South China Sea is still unstable, climate warming makes the Arctic route to Europe through Russia and countries in the Arctic circle a maritime transport channel of great

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strategic value and economic significance. The friendly cooperative relations and economic complementarily between China and Russia, China's strong infrastructure capacity and economic strength, and huge maritime demand, it will enable China to further pay more attention to Arctic routes and relevant infrastructure investment such as land, sea and airport.



△Types of Logistics

One Belt, One Road with a unique advantage of stability, efficiency, wide coverage, all day long, and no influence on air and sea transportation, highlights the importance of the construction of the whole area. It has also become a weapon to solve the dilemma of "one cabin is hard to find" and "one box is hard to find". Since May 2020, China-Europe trains have operated more than 1000 trains in a single month for 15 consecutive months. Since May this year, more than 1300 trains have been operated in a single month for three consecutive months. In July, the operation quality of China Europe trains continued to improve. 1352 trains and 131000 TEUs of goods were operated in the whole month, with a year-on-year increase of 8% and 15% respectively.

China-Europe trains directly transported to European countries, improving the timeliness of goods transportation, it saves time and storage costs, improves the turnover rate of freight and container capacity, and effectively ensures the stability and smoothness of the international industrial chain supply chain. However, One Belt, One Road, is also a key factor in the extreme weather. The central European train has been exposed to the adverse effects of floods and floods in Zhengzhou and other places. This is a short way to deal with

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extreme weather such as power, scheduling, communications and other infrastructure. Therefore, as a representative of the whole area, China's infrastructure along the line should have more input and more lines, and will gradually combine with air and sea transportation to Africa and South-Central America. This will be a major infrastructure construction affecting the world.

(D) Infrastructure Short Board Construction Demand

At the beginning of reform and opening up, China put forward the slogan of "Building Roads Before Getting Rich". It has been committed to improving infrastructure construction and serving economic development. Since 2008, it has been speeding up. After more than ten years of efforts, China's expressways, high-speed railways, hydropower, nuclear power, solar energy, wind energy and communication base stations are among the forefront in the world, However, the advantage and leading position of the total amount is that on the one hand, compared with the economies of the United States, Japan, Germany, Britain, France and Russia, China's per capita infrastructure is relatively backward. Just as China's total economic volume ranks among the top in the world, but its per capita GDP lags far behind the developed economies in the world, there is still a big gap in China's per capita infrastructure, especially in the central and western regions, There is still much room for improvement and more long-term infrastructure investment is needed.

The epidemic since 2020 has put China's logistics and supply chain system through a severe test, proving China's unique global industrial production capacity and the resilience of the supply chain system, but it also highlights many problems, such as insufficient infrastructure, operation capacity and intelligence such as sea and air ports; The worldwide extreme weather since 2021 has verified many problems and lessons in the process of China's rapid urbanization, such as urban flood drainage, public health and emergency rescue, rural flood and waterlogging natural disasters, etc. the problems exposed in Zhengzhou, Henan Province will not only put forward new topics for the future urban construction planning, It also puts forward requirements for us to improve and improve urban infrastructure and emergency system in the short term. Therefore, we have reason to believe that our Congress is facing the construction and improvement of emergency systems such as roads, power supply, telecommunications and public health in cities and villages.

In order to achieve the goal of carbon neutralization by 2060 and environmental protection measures such as energy conservation and emission reduction, China is currently investing in more hydropower projects and photovoltaic power stations in the central and western regions, and building wind power stations in suitable areas

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throughout the country. In terms of nuclear power construction, in addition to coastal areas, China is trying to invest in more nuclear power facilities in inland areas, such as West to east gas transmission UHV power transmission and transformation projects are also gradually promoted, and China's natural gas projects introduced from the Middle East and Russia are gradually applied nationwide. Therefore, more new energy projects, new energy supply modes and channel construction will steadily promote the development of China's infrastructure construction for a long time.



△China's New Energy Construction

1.3 Experience: Thinking & Experience of Advanced Deployment of Infrastructure

In the 1998 financial crisis, China successfully played the image of a responsible big country after recovering Hong Kong in 1997. Instead of devaluing the RMB, China provided $4 billion in aid to Thailand and other Southeast Asian countries. On the one hand, the government adopted the policy of expanding domestic demand for education, medical treatment and real estate to stimulate economic growth, maintaining the healthy and stable growth of the domestic economy, it has played an important role in easing Asian economic tensions and driving Asian economic recovery.

During the economic crisis in 2008, China took advantage of the situation and resolutely invested $4 trillion in infrastructure construction. At that time, many Chinese people and media generally believed that the construction of high-speed railway projects was too advanced. However, China realized the problems and difficulties of rapid export growth at

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the time of global crisis, and then increased bank loans on a large scale and invested heavily in the construction of "railway infrastructure", It invested in the construction of new and expanded industrial development zones and other infrastructure, and actively promoted China's capital investment represented by state-owned enterprises to acquire global mineral resources trapped by the international crisis, so that China can survive the global crisis and further enhance its industrial production and resource self-sufficiency.

Since 2020, the United States has been increasing the speed of printing money to boost the economy and maintain basic social stability by issuing more money. However, the effect of boosting production and consumption is not good, but the negative effect is the popularity of American real estate and soaring prices. According to the data released by the American Association of real estate agents on August 12, the median sales price of existing homes in the United States reached US $357900 in the second quarter, with a year-on-year increase of 22.9%, the largest increase in the same period in 53 years since 1968. Meanwhile, the US CPI in July rose by 5.4% over the same period last year, the largest single month year-on-year increase since 2008.

It can be seen that the inflation in the United States has been very serious, which proves that the large-scale printing of money in the United States did not flow to the real economy, but greatly pushed up the prices of real estate and food. China holds a large number of US bonds and has a large amount of foreign exchange reserves. After we see the consequences of US inflation and the current situation of its own economic slowdown, expanding infrastructure investment and large-scale infrastructure investment to meet China's current and future actual needs may be the best option to deal with another wave of economic crisis.

1.4 Support: Financial Basis for Infrastructure Development & Stability Maintenance

In the first half of 2021, due to the strong recovery of overseas demand after the epidemic, driving China's strong exports and strong support for economic growth, China's fiscal and monetary policies are conservative. However, with the continuous emergence of the trend of high before low, the downward pressure on the economy will increase in the second half of the year, and the domestic fiscal and monetary policies are expected to further exert force. It is difficult to effectively boost consumption and weaken overseas demand, Under the strict control of real estate, infrastructure investment will soon enter another climax.

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△China's Infrastructure Construction

The conservative strategy of bond issuance and fiscal expenditure in the first half of the year also gives more room for policies in the second half of the year. In the first half of the year, the year-on-year growth rate of social finance and M2 continued to decline. In June, the year-on-year growth rate of social finance stock was 11%, and the year-on-year growth rate of M2 was 8.6%, which has remained downward since November last year. In 2021, the national debt limit is 2.75 trillion Yuan, the general debt limit of local governments is 0.8 trillion Yuan, and the special debt limit is 3.65 trillion Yuan. The total of the three is about 7.22 trillion Yuan. From January to July, the cumulative issuance of national debt and government bonds is 2.71 trillion Yuan, with an issuance progress of 38%. There is still a huge elastic space of 4.5 trillion Yuan in fiscal force in the second half of the year, we expect that the progress of financial bond issuance and expenditure and project implementation will be accelerated in the second half of the year, forming the key to financial underpinning and economic growth. Financial bond issuance and expenditure will invest more in infrastructure projects, quickly form physical workload, and infrastructure investment will form a small hot wave from September to October. 7 .30 the meeting of the Politburo stressed that the setting tone of physical workload will be formed at the end of 2021 and the beginning of 2022. The third quarter is the most convenient season for engineering construction in a year. It can be predicted that China will invest more in infrastructure construction and build at a higher speed in the second half of 2021.

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2. Prelude to Large-scale International Infrastructure Investment

2.1 US Infrastructure Investment

Compared with China and the United States, it is mainly reflected in the reasons why the U.S. economy is optimistic in the second half of the year, mainly due to the monetary release of the Federal Reserve and the large-scale economic stimulus plan and infrastructure plan of the U.S. government. Over the past year, the Federal Reserve's money gate has opened wide and injected more than $400 billion into the market. The trillions of dollars of U.S. economic stimulus plan and infrastructure plan will have some practical effects. This may be one of the reasons why institutions are optimistic about the U.S. economy. In this context, on August 10, the US Senate passed an infrastructure investment bill with a total amount of about US $1 trillion. At the same time, it has a budget plan of up to US $3.5 trillion involving priority issues such as health care, child and elderly care, education and climate change. Although the relationship between the two parties in the United States is sharply opposed, the society is seriously torn, and the political ecology is deteriorating. It is unknown how much and how long these broad investment plans can be realized in the political environment of low social efficiency in the United States, these huge plans are ultimately the ambitious economic stimulus policy of the Biden administration, it will certainly bring great benefits to global infrastructure related industries.

2.2 Infrastructure in India

Indian Prime Minister Modi announced on August 15 that he plans to invest 100 trillion rupees (about 8.73 trillion Yuan) in the country's infrastructure to promote economic growth and create jobs. These investments will be used in India's transportation and logistics industry, integrate transportation modes, improve domestic supply chains and connect to international supply chains. At the same time, Modi government also set the goal of achieving energy independence by 2047, He said the goal could be achieved by promoting electric vehicles, turning to a natural gas-based economy and building a hydrogen production center. "This will help reduce domestic travel time and increase industrial productivity, help India's industry become globally competitive and develop economic zones." although there are no details of the Indian government's huge infrastructure and its implementation efficiency, in any case, they are aware of the infrastructure gap with other countries, especially China, It is believed that even the greatly discounted infrastructure plan will greatly boost the export of China's cemented carbide to India, a traditional market.

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2.3 Infrastructure in Other Countries

When extreme weather became the norm around the world, the Nordic countries first tasted the pain. On July 13, Seblitz, Germany, suffered a serious disaster caused by rainfall and flood, which killed at least 180 people and left 150 missing. Then, German President Steinmeier said that the reconstruction funds for the flood were expected to reach billions of euros. The huge climate disaster makes people realize that it is not only necessary to invest more capital construction funds, but also to fundamentally change the original production, life and travel modes, and invest more resources in energy conservation and carbon reduction, new energy application and other infrastructure, so as to gradually reduce carbon emissions and natural disasters. We can foresee that in the post epidemic era, the countries of the world should not only reconsider the infrastructure construction of their industrial production and supply chain, but also need to invest more resources in public health facilities such as medical treatment to deal with the similar public crises that COVID-19 has not yet completed and may erupt at any time.



△Coins/Currencies of Countries

3. Conclusion: The Global Infrastructure Tide Will Maintain the Stability of Tungsten Price

In conclusion, we believe that a new round of global infrastructure construction represented by China, the United States and India will bring a new round of rapid growth

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to China's tungsten industry, put forward higher quantitative and quality requirements for our tungsten products industry, and pose challenges in forming a more flexible and efficient tungsten products production and intelligent supply chain system on the basis of energy conservation and carbon reduction, At the same time, it will also bring stable price and profit expectation of tungsten products in China.

In the international market, the original inventory of tungsten products is about to be exhausted. In the second half of 2021, when a new round of replenishment is about to begin, we have reason to expect a stable rise in the demand and price of tungsten products.

----------The End----------

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Editor's Note

When this article was collated and translated by the end of November 2021, much large changes have been taking place in China and the globally, the price of tungsten in China's market did fall slightly after big rising, and only need to maintain a stable and consistent recovery state (see the trend chart for details attached in this paper). At the same time, several factors signed in this paper have indeed changed as expected: increased energy costs, strict implementation of restrictions, soaring energy shortage prices, rising exchange rates, which may create a record high, increasingly serious squeeze at Los Angeles port and Long Beach port, and the money imbalance will be alleviated in 2022, with increasing transportation costs, survival costs and in transit costs.

In the period before and after the completion of this paper, the "B3W" (Build Back Batter World, like China's One Belt, One Road) proposed by the United States and the "Global Gateway" proposed by the European Union have made new progress. Earlier this month, U.S. revealed that as the first project of theB3W initiative, the United States will invest in 5 to 10 large-scale infrastructure projects around the world in January next year.

In September this year, European Commission President Von Delaine announced the "Global Gateway" 2022, the EU plans to raise 300 billion Euros to invest in infrastructure globally focusing on digital, health, energy, climate and other fields, according to it.

On October 19-21, 2021, China Tungsten Industry Association held 2021 China (Shanghai) Tungsten Raw Material Industry Development Summit. During the forum, major tungsten industry enterprises from China discussed the raw material production, processing technology and cost of materials, the market and future application scenarios of materials, the price of tungsten products and the future forecast of the market. It also gives an optimistic but cautious forecast for the future of tungsten products industry.

We will be happy to share Tungsten, Molybdenum ang Rare Earth market information and price trends in the future, and we will also be very pleased to cooperate in any form with anyone who's interested in it all over the world.

DR. HANNS
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