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MOLYBDENUM

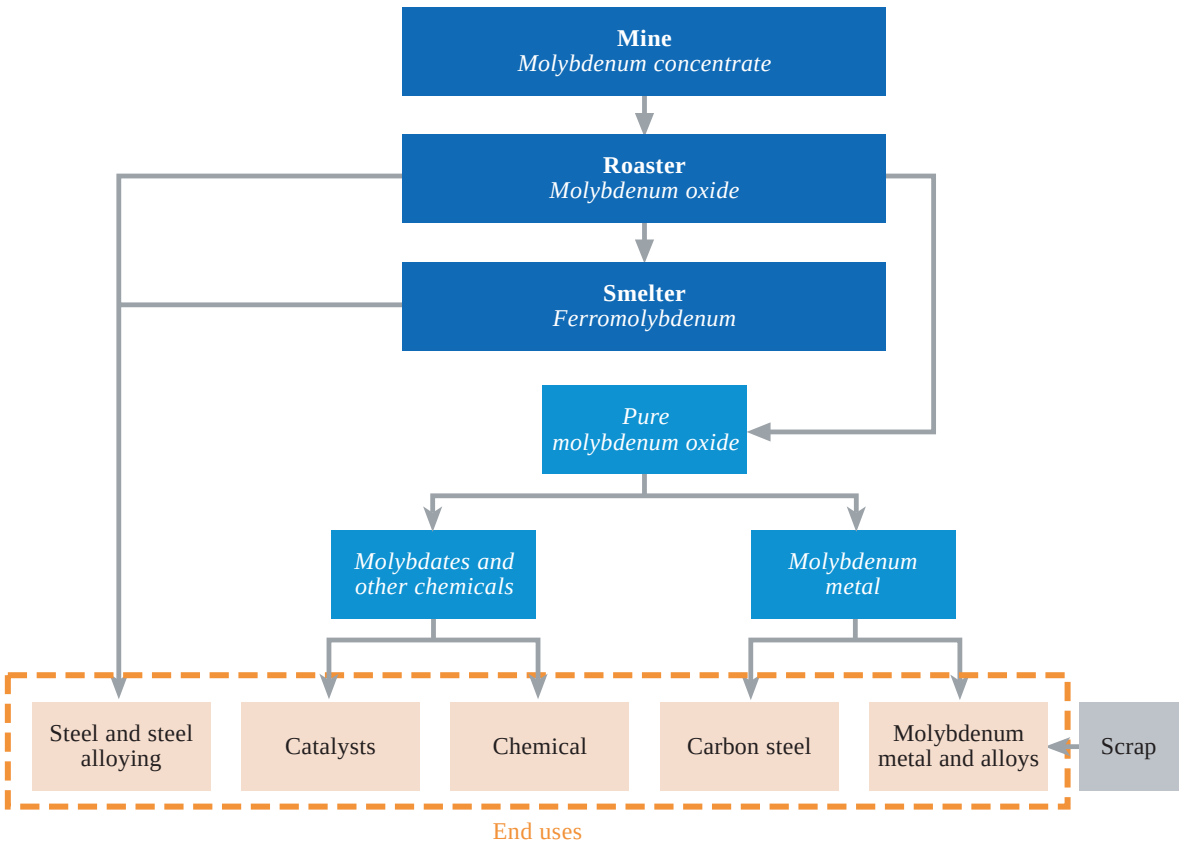
Molybdenum is a silvery white, malleable metal with an exceptionally high melting point (2,625°C) used principally as an alloying agent in steel, cast irons and superalloys to enhance hardness, strength, toughness and resistance to wear and corrosion. It is used as an alloying agent for the production of steel, molybdenum's largest end-use. The high melting point, good thermal conductivity and low thermal expansion properties of molybdenum and molybdenum-based alloys enable molybdenum to be used in a range of hot zone electrical and electronic applications. Furthermore, the ability of the metal and certain of its chemicals to catalyze some chemical reactions lends molybdenum to its major non-metallurgical use as a catalyst.

In most applications, molybdenum has no direct substitutes. Potential substitutes for applications such as a strengthening alloy in steel include vanadium, chromium, columbium and boron. However, such substitution is not currently practised because molybdenum has historically been plentiful, affordable and effective. Further, there is little pricing incentive to use such substitute alloying metals, with the prices of possible substitutes, namely, vanadium and niobium also increasing, such that molybdenum has sustained its price rise since the beginning of 2004.

Molybdenum is traded in a variety of forms, from molybdenum concentrate to products such as molybdenum metals and powder. There is also an active market for molybdenum waste and scrap. In terms of volume, molybdenum concentrate, molybdenum oxide and ferromolybdenum dominate international trade for molybdenum. In 2005, trade in molybdenum concentrate continued to increase, particularly with imports into China to utilize spare roasting capacity. In 2004, trade in molybdenum oxide and ferromolybdenum also increased, but not to the same extent and molybdenum oxide was exported mainly from Chile (representing 29.9% of global exports in 2004), China (19.7%), the Netherlands (19.6%), the United States (16.4%) and Belgium (8.0%). China dominates international trade of ferromolybdenum, accounting for approximately 52.4% of global exports in 2004.

Demand for molybdenum comes primarily from the steel industry, which accounted for approximately 71% of the total world-wide consumption of molybdenum in 2005. Globally, molybdenum is mainly consumed as molybdenum oxide or ferromolybdenum, with other forms including molybdates, scrap and molybdenum metal. The uses of molybdenum are largely metallurgical; in steels, iron, non-ferrous alloys and molybdenum based alloys.

Below is a simplified market flow diagram for molybdenum.



Source: Derived from the information in the Roskill Molybdenum Economics Report

The estimated world-wide demand for molybdenum by application in 2005 was as follows:

Estimated division of world molybdenum consumption by application, 2005

	Kt	%
Stainless steel	50	28
Full-alloy steel	27	15
Tool and high-speed steel	18	10
High strength low alloy (HSLA) steel	17	9
Carbon steel	16	9
Catalysts	14	8
Molybdenum metal and alloys	13	7
High performance alloys (HPA)	9	5
Cast iron	6	3
Lubricants	6	3
Pigments/corrosion inhibitors	4	2
Other chemical	2	1
Total	**181**	**100**

Source: Roskill Molybdenum Economics Report

Molybdenum is regarded as an indispensable alloying element in high-performance stainless steels and is present in 15% to 20% of stainless steel grades produced, or in tonnage terms, 7% of stainless steel produced contains molybdenum Grade 316, containing between 2% and 3% molybdenum. Stainless steel, which accounted for approximately 28% of the total molybdenum consumption in 2005, is the largest market for molybdenum. Molybdenum stainless steels are largely used in medium-level corrosive environments, such as external architectural applications. There is, however, a growing use of the so-called 'super' grades, which contain higher levels of molybdenum, particularly in flue-gas desulphurization in coal and oil-burning plants.

Full-alloy steel, which refers to steels other than carbon, stainless, tool and high-speed, and high-strength low-alloy (HSLA), is the second largest market for molybdenum. Full-alloy steel typically contains carbon, silicon and manganese, together with chromium, niobium, molybdenum and vanadium, to increase tempering resistance and to introduce secondary hardening. Large tonnages of these steels are used in the construction industry and in shipbuilding, heavy machinery and transport systems. In these applications, molybdenum levels are normally less than 1%, but some maraging and high-strength steels can contain over 9% Mo. Maraging steel is an iron alloy which is known for possessing superior strength without losing malleability.

Tool and high-speed steels typically contain between 1% and 4% Mo, but some contain up to 9.5% Mo. These applications accounted for about 10% of molybdenum consumption in 2005. Growing automobile production in Asia is driving the demand for these steels.

HSLA steels are used in oil and gas pipelines, as well as in the automotive and construction industries. The steels are specifically developed to give good yield strength and as a result constitute a secure, mid-sized market for molybdenum.

Approximately 1% of carbon steels contain molybdenum in levels up to 0.15%, with some specialized types containing up to 0.4% Mo for increased yield strength, hardness and toughness.

Catalytic applications are the most important chemical end-use for molybdenum, accounting for approximately 8% of molybdenum consumption in 2005. The principal uses of molybdenum catalysts in oil refining are in the hydrotreatment of naphtha, kerosene, gas oils, cycle oil, deasphalted oil, diesel and residues for the production of naphtha, middle distillates, low-sulfur diesel and fuel oil, and hydrocracker feed.

Molybdenum metal and alloys are used in applications where strength and corrosion resistance at temperatures of up to 2,000°C is required. The main areas of use for molybdenum and its alloys are in furnaces and other hot zone applications in the lighting and glass industries, electrical and electronic applications, and the nuclear-energy and space industries.

Molybdenum and its related chemicals are also used in high-performance alloys, cast iron, lubricants (largely molybdenum disulfide), pigments and corrosion inhibitors in paint and other coatings.

WORLD MOLYBDENUM INDUSTRY

World molybdenum reserves

Molybdenum does not occur as a native metal in nature. Molybdenite, its only commercially viable mineral form, is often found in porphyry deposits in association with copper or other metals such as silver, gold, tin and tungsten.

Molybdenite can be present in three main types of base metal porphyry deposit. Porphyry copper deposits are the most common and many contain economic concentrations of molybdenite (copper-molybdenum porphyries) with grades typically ranging from 0.02% Mo to 0.08% Mo (although lower grades are possible). The mining of porphyry copper deposits gives rise to the extraction of molybdenum as a by- or co-product. The second type is porphyry molybdenum deposits, which often contain no copper and are primarily mined for the extraction of molybdenum. The third type is climax molybdenum ore, which is a sub-type of porphyry molybdenum deposits and thereby less prevalent. Climax molybdenum ore has different geotectonic affinities and typically contains higher molybdenum grades (0.2% to 0.5% Mo).

According to the Minarco Report, CMOC's molybdenum resources (at an average grade of 0.10% Mo) are of a higher grade than the majority of global major molybdenum deposits and are regarded as high-grade relative to comparable molybdenum deposits globally.

Almost 38.4% of world molybdenum reserves, and approximately 43.6% of the world's molybdenum reserve base, are located in China. In 2005, the United States contained the second largest reserves and reserve base, representing approximately 31.4% and approximately 28.3% of world molybdenum reserves and reserve base respectively. In 2005, Chile ranked third with approximately 12.8% of world molybdenum reserves and approximately 13.1% of the world's molybdenum reserve base. The following table sets out the world reserves and reserve base of molybdenum:

Estimated world molybdenum reserves, 2005 (contained Kt)

	Reserves[1]	% total	Reserve base[2]	% of total
Asia:				
China	**3,300**	**38.4%**	**8,300**	**43.6%**
Iran	50		140	
Kazakhstan	130		200	
Kyrgyzstan	100		180	
Mongolia	30		50	
Uzbekistan	60		150	
Sub-total	***3,670***		***9,020***	
Europe:				
Armenia	200		400	
Russia	240		360	
Sub-total	***440***		***760***	
North America:				
Canada	450		910	
Mexico	90		230	
U.S.	**2,700**	**31.4%**	**5,400**	**28.3%**
Sub-total	***3,240***		***6,540***	
South America:				
Chile	**1,100**	**12.8%**	**2,500**	**13.1%**
Peru	140		230	
Sub-total	***1,240***		***2,730***	
Total	**8,590**		**19,050**	

Source: Roskill Molybdenum Economics Report

Notes:

(1) Reserves are that part of the reserve base which is economically extractable and recoverable.

(2) Reserve base consists of measured and indicated resources that meet the criteria of grade, thickness, quality and depth required by current mining and recovery practice. It includes resources that are currently economic, marginally economic and sub-economic.

The table above shows that in 2005, the world's total estimated molybdenum reserves and reserve base stood at approximately 8.6 Mt and approximately 19.1 Mt, respectively. According to the CNMIA Report, CNMIA estimates that primary deposits account for approximately 68% of the world's total molybdenum reserve base, while associate deposits account for approximately 32% of the reserve base.

World production of molybdenum

Molybdenum production comprises mining and concentrating followed by conversion to molybdenum oxide by roasting. Some molybdenum oxide and molybdenum concentrate are then further processed to produce ferromolybdenum, molybdates and other chemicals, or molybdenum metal prior to consumption. Small and largely unrecorded amounts of molybdenum are recycled, usually without conversion to a molybdenum product.

Primary production (mining, concentrating and processing)

Primary production is usually derived from two sources; as a by-product of copper-porphyry mining and through the extraction of molybdenum from porphyry molybdenum deposits as the primary product. Although associate deposits are estimated to account for approximately 32% of the world's total molybdenum reserve base, by-product production represented around 66% of molybdenum mine production in 2005.

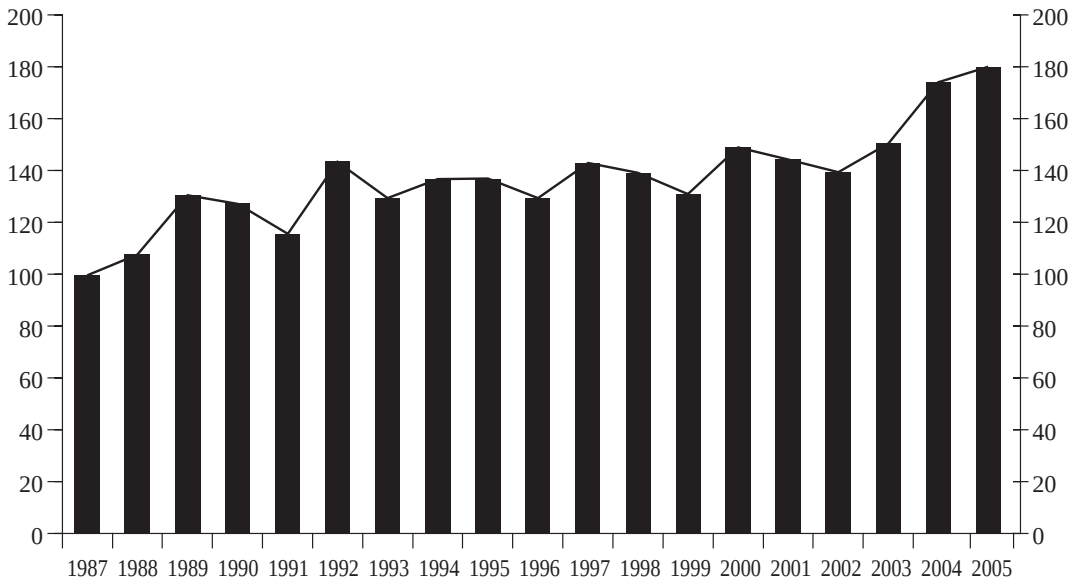
Most molybdenum is mined by open-pit methods. Once the ore has been crushed, molybdenum is predominately recovered by conventional flotation (separated from copper concentrate by selective flotation where necessary) to produce molybdenum concentrate, typically containing 45% to 55% molybdenum.

World molybdenum mine production is highly concentrated. According to the Roskill Molybdenum Economics Report, the ten largest producers accounted for about two thirds of the world molybdenum mine production in 2004.

According to the estimate of Roskill, world molybdenum output (measured by molybdenum contained), reached 180.0 Kt in 2005, representing a CAGR of 3.9% since 2000, with output increasing by almost 16% year-on-year in 2004 alone in response to increased demand from the iron and steel industries.

Despite greatly increased U.S., Chilean and Peruvian production, molybdenum production increased by only 4.1% in 2005, as a result of sharp falls in Chinese production arising from the suspension of operations at mines in the Huludao region and the Qingtian region.

World mine production of molybdenum, 1987–2005 (Kt contained Mo)



Source: Roskill Molybdenum Economics Report

World production is dominated by the three countries with the largest molybdenum reserves. The United States is the largest producer of mined molybdenum with a market share of 32% in 2005, followed by Chile and China. During the period from 2000 to 2005, these three countries accounted for approximately 77% of the world's total molybdenum production. Set out below is a breakdown of the world molybdenum production by the top three countries.

Breakdown of world molybdenum production by principal countries (Kt contained Mo), 2000–2005

Country	2000		2001		2002		2003		2004		2005	
China	41.0	27.6%	37.7	26.2%	44.0	31.6%	48.0	31.9%	50.2	28.9%	35.3	19.6%
U.S.	41.2	27.7%	37.9	26.3%	31.9	22.9%	33.7	22.4%	42.1	24.2%	56.9	31.6%
Chile	33.6	22.6%	33.4	23.2%	30.2	21.7%	34.2	22.7%	41.8	24.0%	47.7	26.5%
Subtotal	115.8	77.9%	109.0	75.6%	106.1	76.2%	115.9	77.1%	134.1	77.1%	139.9	77.7%
World Total	148.7	100.0%	144.1	100.0%	139.2	100.0%	150.4	100.0%	173.9	100.0%	180.0	100.0%

Source: Derived from the data in the Roskill Molybdenum Economics Report

Molybdenum production in China decreased from 31.9% in 2003 to 19.6% in 2005 in terms of total world production as a result of the increase in by-product production from the U.S., Chile and Peru and the suspension of operations at mines in the Huludao region and the Qingtian region of China in 2005.

Due to the market structure for molybdenum, not all mined material reached the market due to roaster capacity limitations in 2004, 2005 and 2006.

Raw molybdenum concentrate is roasted in a multiple hearth furnace at temperatures of approximately 650°C to produce molybdenum oxide, typically having 90% purity (containing approximately 60% molybdenum metal). Molybdenum oxide is the raw material for the preparation of most other molybdenum products, and it can be added directly to steel, cast iron and other metal alloys. It is produced as a powder or as briquettes.

Few significant mining operations in the western world have their own molybdenum concentrate roasting facilities. As a result, a significant proportion of molybdenum concentrate is either sold in the raw state, or toll-roasted to produce molybdenum oxide. In China, roasting facilities are often integrated into the mining operation. Small roasting plants exist in Armenia, Iran, Japan, Mongolia, Russia and Uzbekistan.

Ferromolybdenum, containing 60% to 75% of molybdenum, is made by smelting molybdenum oxide with iron oxide in a conventional metallothermic process using silicon and/or aluminum as a reductant. Ferromolybdenum can be added directly to steel, cast iron and high performance alloys as an alternative to molybdenum oxide.

A number of ferroalloy companies have ferromolybdenum production capacity as part of their overall ferroalloy capacity, but only a small proportion may be used to produce ferromolybdenum, depending upon demand. Consequently, although nominal capacity to produce ferromolybdenum may be elastic, demand from the iron and steel industry for other ferroalloys can limit available capacity.

Ownership of roasting and smelting facilities is also relatively consolidated globally. Participants include integrated Chinese producers, independent operators and a handful of western molybdenum producers.

Although little data on the production of ferromolybdenum is published, Roskill estimates world output of ferromolybdenum is in the order of 70 Kt per year (gross weight).

World ferromolybdenum production data, 1999–2004 (Kt gross weight)

Country	1999	2000	2001	2002	2003	2004
China	38.5	44.4	37.7	29.6	29.4	na
UK	11.5	8.0	10.7	12.0	15.0	15.5
Others	19.2	13.6	17.8	14.2	14.4	na
Total	69.2	66.0	66.2	55.8	58.8	na

Source: Derived from the data in the Roskill Molybdenum Economics Report

Secondary production

The principal form of secondary molybdenum production is molybdenum recycling from waste and scrap. Secondary molybdenum metal is recycled as a component of catalysts, ferrous scrap and super alloy scrap.

Catalysts are both recycled and regenerated, in which the catalyst is reused, restoring between 75% and 95% of its catalytic activity with each regeneration. Ferrous scrap is either generated and used within steel mills during steel making, or consists of trimmings from fabrication processes or unusable fabricated items. Molybdenum is not recovered separately from recycled steel and super alloys, rather, it is recycled in its alloy form.

While no data is published for the recycling of molybdenum, Roskill estimates that the molybdenum content of scrapped products available to the industry is in the order of 30 Kt per year (excluding recycling of waste generated during steel making and other production processes).

World consumption of molybdenum

Demand for molybdenum primarily comes from the steel industry, which accounted for approximately 71% of the world's total consumption of molybdenum in 2005. The global market for molybdenum is estimated to have grown from approximately 140.2 Kt in 2000 to 181.0 Kt in 2005 at a CAGR of 5.2%. This compares with a world real GDP growth rate of 2.9% per year over the same period. Western Europe, the United States, Japan and China are the four major markets for molybdenum, accounting for approximately 33%, 21%, 15% and 10% of the total world consumption in 2005, respectively. Although Western Europe remains the largest market, China represents the fastest-growing major market for molybdenum, at a CAGR of 17% in molybdenum demand between 2000 and 2005. Set out below are estimates of the world's total consumption by major markets from 2000 to 2005:

World consumption of molybdenum[(1)] by region, 2000–2005 (Kt Mo)

	2000	2001	2002	2003	2004	2005	CAGR (2000–2005)
United States . .	34.0	31.8	30.4	30.4	36.0	38.0	2.3%
Western Europe .	51.3	51.3	50.8	55.4	60.6	60.0	3.2%
Japan	22.2	22.2	22.2	24.5	27.1	28.0	4.8%
China	8.2	9.2	11.3	14.0	16.5	18.0[(2)]	17.0%
Others.	24.5	26.8	28.1	32.7	35.0[(2)]	37.0[(2)]	8.6%
Total	140.2	141.3	142.8	157.0	175.2[(2)]	181.0[(2)]	5.2%

Source: Derived from the data in the Roskill Molybdenum Economics Report

Notes:

(1) Consumption in the market does not include the use of molybdenum in the production of other molybdenum products.

(2) Estimated figures.

International trade in molybdenum

Most molybdenum is traded in the form of molybdenum oxide or ferromolybdenum. There are smaller markets for molybdenum in other forms, such as refined metal powder or ingots, ammonium, calcium and sodium molybdates, purified molybdenum disulfide, and various other chemical compounds. There is also an active market for molybdenum waste and scrap.

Estimated total molybdenum content of products entering into international trade was about 230 Kt in 2004, about 30% more than global mine production. This excess represents some duplication as a result of the lack of integration in the world molybdenum industry, and hence the re-export of significant volumes largely from the Netherlands, which functions as a significant transiting and warehousing location and houses molybdenum processing facilities. Conversely, the PRC Government's policy to add value to exports of metals and minerals, including molybdenum, has led to the vertical integration of most molybdenum mining and extraction operations within the country, with China being a key producer of molybdenum oxide and ferromolybdenum.

Most molybdenum is traded in the form of molybdenum oxide (often referred to as roasted concentrate or simply oxide) or ferromolybdenum, which reflects the demands of the steel industry as the dominant end-user of the metal. In 2005, trade in molybdenum concentrate continued to increase, particularly with imports into China to utilize its spare roasting capacity. To a lesser extent, trade in molybdenum oxide (as roasted concentrate) and ferromolybdenum also increased. In 2004, molybdenum oxide was exported mainly from Chile (representing 29.9% of global exports in 2004), China (19.7%), the Netherlands (19.6%), the United States (16.4%) and Belgium (8.0%). China dominates the international trade of ferromolybdenum, accounting for approximately 52.4% of global exports in 2004. Furthermore, China is also the main source of molybdenum metal, including semi-finished articles of molybdenum metal and molybdenum-based alloys, powder and waste and scrap.

Molybdenum prices tend to be quoted in pounds of contained molybdenum (Mo). Molybdenum products are not traded on an exchange. Therefore no terminal or futures market exists for molybdenum products where producers, consumers and traders can fix an official or settlement price. Molybdenum concentrate, molybdenum oxide and ferromolybdenum are sold, largely on a spot basis, by traders and dealers world-wide. Some business is done on the basis of long-term supply contracts between producers and consumers, and the major producers have a network of sales offices through which molybdenum products are bought.

Price information is published by trade journals. A large volume of Chilean concentrate and oxide and Chinese oxide and ferromolybdenum are warehoused in Rotterdam prior to sale. Prices realized are published weekly by trade journals for the European and U.S. markets. European prices are quoted in U.S. dollars per pound (US$/lb) of contained molybdenum for molybdenum oxide, and U.S. dollars per kilogram (US$/kg) of contained molybdenum for ferromolybdenum. U.S. prices for both oxide and ferromolybdenum are quoted in US$/lb of contained molybdenum or gross weight depending on the source. Ferromolybdenum normally commands a price premium over oxide to reflect conversion costs.

There is normally little difference between European and U.S. prices of oxide and ferromolybdenum, and neither price is consistently lower or higher than the other. As the largest consumption market, European molybdenum oxide prices are an important measure of molybdenum price and are widely used and typically quoted within the molybdenum industry and by industry specialists, commodity and equity analysts as a benchmark of molybdenum prices. Molybdenum

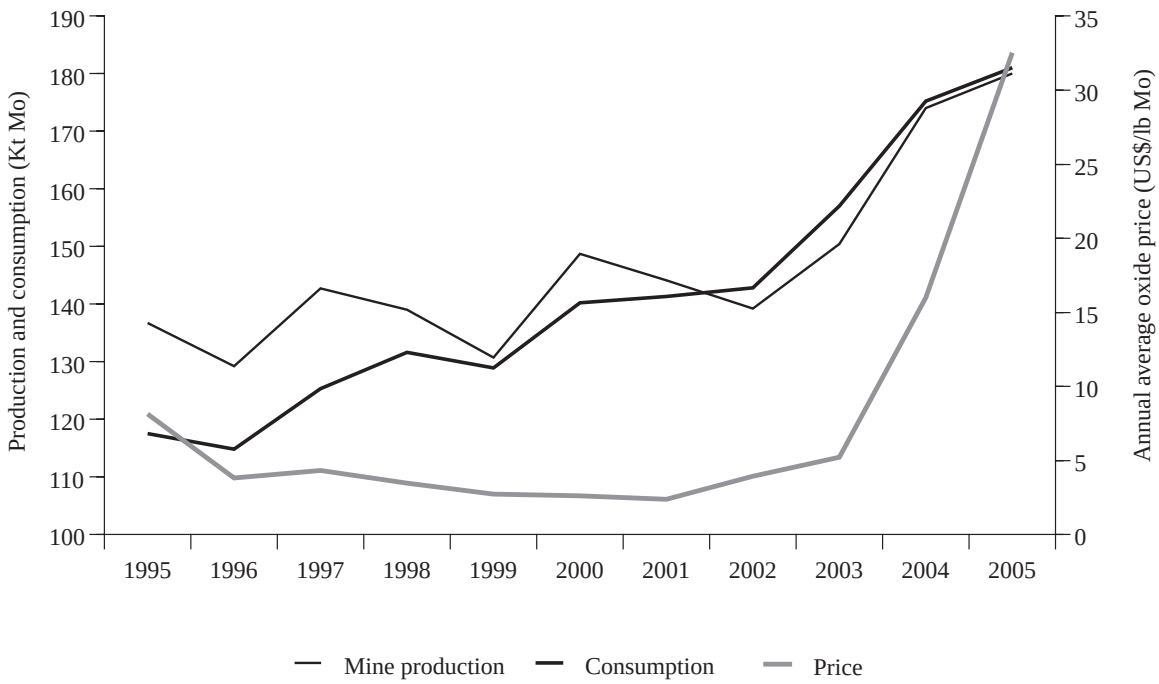
oxide prices are typically used by industry participants as a benchmark to relate molybdenum concentrate and ferromolybdenum prices. Prices of concentrate are no longer separately quoted as they are based on prices for molybdenum oxide, with penalties for deleterious elements.

World production, consumption and prices of molybdenum in recent years

The price of molybdenum is primarily determined by changes in supply and demand. Demand for molybdenum and molybdenum products is mainly determined by industrial activity. Supply of molybdenum historically reacted slowly to changes in market demand as a result of the large proportion of by-product production, mainly copper, and the lagged response in bringing on new supply. This has historically resulted in large swings in the balance between supply and demand of molybdenum.

Set out below is a chart showing the world's molybdenum production and consumption as well as molybdenum price, measured by annual average European molybdenum oxide price, between 1995 and 2005:

World production, consumption and prices of molybdenum 1995–2005



Source: Roskill Molybdenum Economics Report

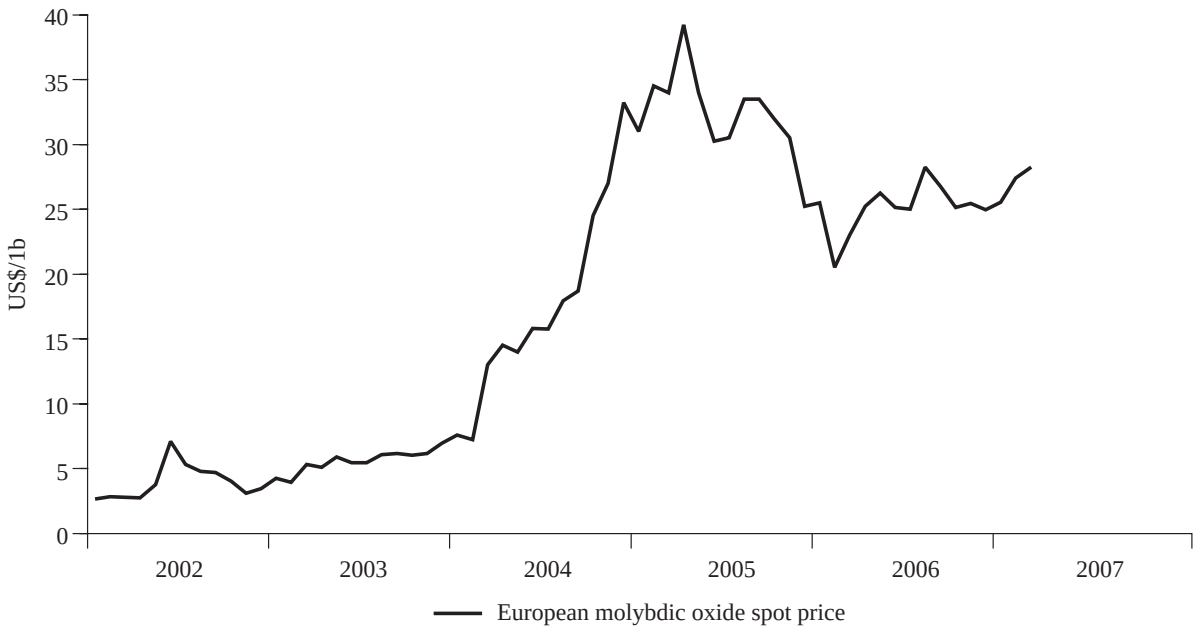
Historically, the molybdenum market has been in surplus as the large element of by-product output was not sensitive to market conditions. In 2003, however, the market moved into deficit. In response to the tight supply, by-product producers started to both optimize mining for molybdenum and increase recovery of molybdenum, and the strong copper market resulted in increased output of copper-molybdenum ore.

The price of molybdenum peaked in May 2005 between US$40/lb and US$50/lb, significantly higher than the average price of molybdenum of approximately US$4.50/lb for the period between 1994 and 2004 inclusive.

Producers without roasting capacity must pay a third party to roast molybdenum concentrate into molybdenum oxide, and must therefore accept the market price of molybdenum less a roasting process charge. Roskill estimates that processing charges have also increased, in line with the roasting capacity shortages experienced.

The monthly average European prices of molybdenum oxide from January 2002 to March 2007 are set out in the chart below:

European molybdenum oxide prices (January 2002 – March 2007)



Source: Derived from the data in the Roskill Molybdenum Economics Report, updated to March 2007

Based on the analysis of CNMIA, the sharp rise in world molybdenum prices in recent years has been mainly attributable to the following four factors:

- Strong increase in demand, driven by strong growth in the steel and petroleum industries and a recovery in the automobile sector;
- Limited global capacity for roasting of molybdenum concentrate and limited refining capacity;
- Decrease in supply from China between 2004 and 2005, as a result of the PRC Government's measures to tighten the regulation of the domestic molybdenum industry and suspend operations of smaller mines, due to concerns over environmental issues and inefficient energy consumption of smaller mines; and
- Depreciation of the U.S. dollar against other major currencies since 2001.

World molybdenum industry outlook

Roskill expects the market to remain dependent on supply disruptions during 2006, 2007 and 2008, with roasting capacity shortages continuing to be critical in the absence of additional roasting capacity to cover the expected growth in demand.

Much of the expansion of the global molybdenum market will be driven by ongoing industrialization in China, with demand for steel used in the generation of basic products such as construction materials, power generation, chemicals, plastics and petroleum products increasing sharply to support the burgeoning manufacturing sector. In the longer term, industrial growth in India and other Asian countries could translate into significantly greater demand for molybdenum. Roskill estimates that the global market for molybdenum has grown at an annual average growth rate of 4.3% between 1990 and 2005. Roskill estimates that the world's total consumption of molybdenum will increase by an average of 4.2% per year, above annual global GDP growth of approximately 3.0% to 3.5%, between 2005 and 2008, resulting in a market of approximately 204.8 Kt by 2008 and that China has the largest growth in demand for molybdenum, with an expected GDP growth of 9.0% per year.

Supply of molybdenum is expected to remain generally lower than global demand in 2006, 2007 and 2008. The shortage of usable molybdenum in the form of molybdenum oxide has been, and is expected to be, the driving factor of the supply deficit. According to the Roskill Report on Molybdenum Prices, as the supply and demand situation for molybdenum oxide and the availability of roasting capacity are the key drivers for molybdenum prices, the estimated supply deficit in molybdenum oxide is expected to have a supporting effect on molybdenum prices. Roskill estimates that the world's total roasting capacity will reach 201.3 Kt by 2008, slightly below the expected total world demand 204.8 Kt in 2008.

The table below shows the proposed expansions in molybdenum roasting capacity as identified in September 2006 by Roskill:

Proposed molybdenum roasting projects, as identified in September 2006

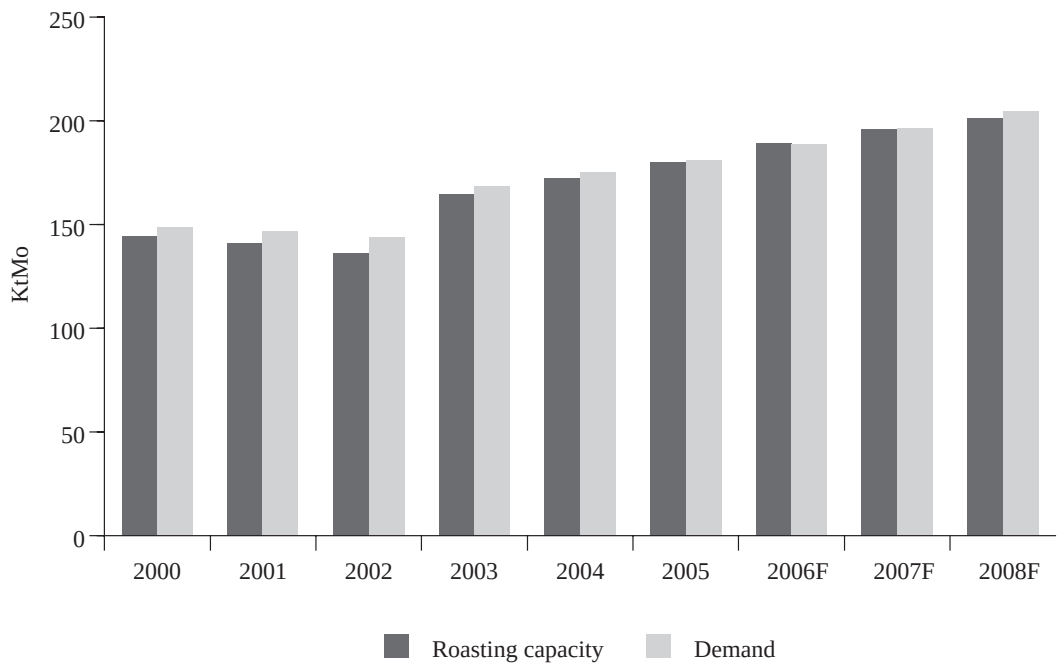
Company	Location	Project	Capacity (Kt per year Mo)	First year at designed capacity
Sadaci (Molymet)	Ghent, Belgium	Roasting plant expansion	2.3	2006–2009
Molymet	Nos, Chile	Roasting plant expansion	20.0	2006–2009
Amerigo Resources . . .	Santiago, Chile	New roasting plant	0.5	2006
Soyuzmetallresurs	Ziriken, Chita, Russia	New roasting plant	3.0	2006
Hunan Shizhuyuan	Shizhuyuan, China	Process plant expansion	1.0	2007
Idaho General . .	Mount Hope, Nevada, U.S.	New roasting plant	15.4	2011

Source: Roskill Report on Molybdenum Prices

Roskill expects that whilst there is probably some spare roasting capacity in China, regulation of the molybdenum mining and processing industry, and rising domestic demand in China, coupled with growing global demand, will result in an expanding deficit that new projects in the West can only partially offset.

Set out below is a chart showing world molybdenum demand and roasting capacity from 2000 to 2005 and the forecast world molybdenum demand and roasting capacity from 2006 to 2008 as estimated by Roskill:

World molybdenum demand and roasting supply, 2000 – 2008F



Source: Roskill Report on Molybdenum Prices

Assumptions and parameters

Certain information on the forecast world demand and supply of molybdenum in this section is extracted from the commissioned Roskill Report on Molybdenum Prices. The assumptions and parameters are as follows:

Assumptions and parameters for the demand of molybdenum

- The world forecast of molybdenum consumption by application in 2005 as set out in the table headed "Estimated division of molybdenum consumption by application, 2005" on page 66 of this prospectus and 2008 which is set out in the following table:

World: Forecast division of world molybdenum consumption by application, 2008

	Kt	%
Stainless steel	60	29
Full-alloy steel	30	15
Tool and high-speed steel	20	10
High strength low alloy (HSLA) steel	19	9
Carbon steel	17	8
Catalysts	16	8
Molybdenum metal and alloys	14	7
High performance alloys (HPA)	10	5
Cast iron	6	3
Lubricants	7	3
Pigments/corrosion inhibitors	4	2
Other chemical	2	1
Total	**205**	**100**

- Molybdenum-bearing stainless steels in China are expected to account for a disproportionately high share of the rapidly increasing stainless steel output because, in part, of the high levels of sulfur dioxide in the atmosphere from coal-burning power stations. In China, production capacity is expected to reach 8.6 Mt per year by 2007, and stainless steel consumption of 6.0 Mt is predicted for 2008, with 450 Kt of stainless steel expected to contain an average of about 3% Mo. This compares with about 80 Kt in 2005;

- Demand in the EU, North America and Japan is likely to grow at a slower pace of 2% to 3% per year, whereas demand in India will probably fall somewhere between the industrialized world and China. Global molybdenum demand for stainless steel, driven by the Chinese market, can be expected to grow at an average rate of at least 6% per year between 2005 and 2008 resulting in a market of some 60 Kt per year;

- Annual global GDP growth of approximately 3.0% to 3.5% between 2005 and 2008;

- Total consumption of molybdenum will increase by an average of 4.2% per year for the respective period; and

- China has the largest growth in demand for molybdenum, with an expected GDP growth of 9.0% per year.

Assumptions and parameters for supply

- Expansions in molybdenum roasting capacities in the coming years as referred to in the table headed "Proposed molybdenum roasting projects, as identified in September 2006" on page 76 of this prospectus; and

- An increase in the world's total roasting capacity to 201.3 Kt in 2008.

Supply-demand balance

- The supply and demand balance of roasting capacity and demand as set out in the table headed "World molybdenum demand and roasting supply, 2000–2008F" on page 77 of this prospectus; and

- The supply-demand balance forecast assumes that Molymet, the largest independent roaster of molybdenum concentrate, will introduce new capacity of 5.6 Kt per year for the period from 2006 to 2008, as proposed by Molymet. However, if any of the Molymet projects fail to materialize, the supply shortfall in the market may widen.

CHINA'S MOLYBDENUM INDUSTRY

China has been playing an increasingly important role in the global molybdenum industry in the recent years:

- It has the largest reserves and reserve base, accounting for approximately 38.4% and 43.6% of the world's total reserves and reserve base respectively;

- It has been the leading molybdenum producer since 2002, except in 2005; and

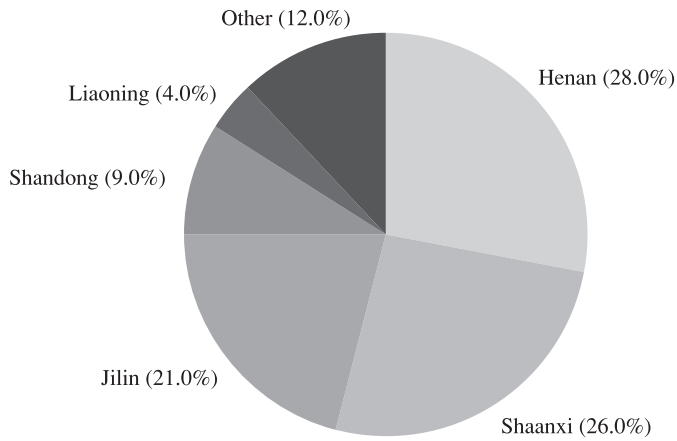
- It is one of the four major consumption markets and has been the fastest-growing major molybdenum consumer, far outpacing the growth of the other three major consumption countries from 2000 to 2005.

China's molybdenum industry is still at a developmental stage. Though reserves are concentrated in only three provinces and there are only two integrated molybdenum producers in China, the industry is still highly fragmented. Historically, numerous processors undercut each other on pricing and operated on a limited production scale often without compliance with safety and environmental regulations. The PRC Government views molybdenum as one of the strategic metals and has been stepping up efforts to regulate less efficient, pollutive mining, processing and refining facilities.

China's molybdenum reserves

In 2005, China's molybdenum reserves and reserve base, measured by molybdenum metal contained, were estimated by Roskill to be 3.3 Mt and 8.3 Mt, respectively. Roskill estimates that resources containing a grade of less than 0.1% Mo account for around 65% of China's total molybdenum resource, with those grading 0.1% to 0.2% Mo comprising a further 30%. Chinese molybdenum reserves reported to the IMOA annual conference in 2005 totaled 2.0 Mt (molybdenum content) distributed as shown below.

Geographical distribution of molybdenum reserves in China, 2005



Source: Roskill Molybdenum Economics Report

CNMIA estimates that China's molybdenum reserves and reserve base, measured by molybdenum metal contained, are 4.0 Mt and 9.8 Mt, respectively, slightly higher than Roskill estimates. Based on the estimate of Roskill, approximately 38.4% of the world's molybdenum reserves, and approximately 43.6% of the world's molybdenum reserve base, are located in China.

According to CNMIA, in terms of the geographical distribution of molybdenum resources in the PRC, Henan Province has the largest deposit volume, which represents almost 40% of the molybdenum resources in the PRC, with the deposits mainly found in Luoyang. The deposit volume in Shaanxi Province and Jilin Province each represents approximately one-fifth of the molybdenum resources in the PRC, and the three provinces together represent almost 80% of the total volume of deposits in the PRC.

According to the CNMIA Report, three out of the six largest mining areas for primary molybdenum deposits in the world are located in the PRC:

Name of the mines	Region	Current deposit (contained tonnes)	Average grade %
Luanchuan Molybdenum Mine (欒川鉬礦田)	Henan	1,940,000	0.103
Daheishan Molybdenum Mine (大黑山鉬礦)	Jilin	1,000,000	0.066
Jinduicheng Molybdenum Mine (金堆城鉬礦)	Shaanxi	670,000	0.099

Source: CNMIA Report

China's molybdenum exports and imports

China is a major supplier of molybdenum oxide and ferromolybdenum to the world, and is itself also a large market for molybdenum. China's main exports are ferromolybdenum and molybdenum oxide and main imports are molybdenum concentrate and molybdenum oxide. Since 1996, Chinese exports have been a crucial element of supply to the West and industrialized Asia. In recent years, China's exports to industrialized countries decreased in relative terms as domestic demand for molybdenum grew rapidly. Estimates of China's molybdenum supply and consumption numbers vary from source to source as a result of a lack of reliable official statistical data. The table below shows China's domestic consumption, imports, exports and implied domestic output between 2000 to 2005, based on the estimate of CNMIA:

China's supply and disposal of molybdenum products, 2000 – 2005 (tonnes estimated Mo content)

	2000	2001	2002	2003	2004	2005	CAGR (2000 – 2005)
Domestic consumption	8,050	9,120	12,320	14,090	16,640	18,900	18.6%
Exports	43,483	41,308	41,867	44,899	45,734	34,874	(4.3)%
Imports	10,545	13,527	9,471	11,339	12,212	17,045	10.1%
Implied domestic output[(1)]	40,988	36,901	44,716	47,650	50,162	36,729[(2)]	(2.2)%

Source: CNMIA Report

Notes:

(1) Implied domestic output is equal to an amount represented by the sum of domestic consumption and exports, less imports, without taking into account inventory changes.

(2) In 2005, output fell sharply, mainly because of the suspension of mining operations in Huludao.

As the above table illustrates, China's exports have decreased by 4.3% from 2000 to 2005 while imports have recorded an increase of 10.1% over the same period of time. The major reasons are: (1) China's domestic consumption has grown substantially with a CAGR of 18.6% (based on the estimate of CNMIA), due to the robust demand from the booming steel industry in China; (2) China's output dropped sharply in 2005, due to the PRC Government's decision to suspend molybdenum mining activities at Huludao (葫蘆島礦區), located in Liaoning Province, and its decision to clean up the operations of Qingtian mines (青田礦區), located in Zhejiang Province, because of concerns over the inefficient use of resources and environmental issues.

China is a leading molybdenum producing country and is expected to play a more prominent role in global molybdenum supply, and to have a greater influence in the world molybdenum market, in the future.

China's molybdenum production and consumption

China's output of molybdenum products is mainly in the form of ferromolybdenum and molybdenum oxide. However, China's domestic demand for molybdenum products is primarily for ferromolybdenum (for metallurgical use in the steel industry).

On the supply side, although there are numerous producers of molybdenum and related product in China, most of them operate on a limited production scale. The two largest molybdenum producers in China are JDC and us, both of which have complete and integrated production lines, and accounted for over 50% of China's total output of molybdenum in the first half of 2006.

In line with the PRC Government's policy to improve environmental protection and reduce inefficient use of resources, the PRC authorities suspended molybdenum mining activities at Huludao (葫蘆島礦區) and Qingtian (青田礦區) in 2005 and 2004, respectively. At the time of their closures, mining in Huludao accounted for approximately 25% of the PRC's total molybdenum mining output. According to the CNMIA Report, the Qingtian area (青田礦區) had an annual molybdenum concentrate production of approximately 7 Kt to 8 Kt in 2003 while the Huludao area (葫蘆島礦區) had an annual molybdenum concentrate production of approximately 30 Kt. The closures of Huludao and Qingtian resulted in a sudden shortage in the supply of molybdenum and contributed to a change in the demand and supply dynamics of molybdenum in the world. Our Directors consider that, unlike such unregulated mining activities at Huludao and Qingtian, we are a leading producer of molybdenum in the PRC with large scale, world-class integrated mining and processing facilities and comply with the PRC environmental laws and regulations in all material respects, and have obtained all approvals necessary for our operations. As such, we have not been subject to, and do not expect to be subject to, any suspension of operations as a result of the PRC Government's efforts to close non-environmentally-friendly and inefficient mines.

As the PRC Government continues its environmental protection efforts, there could be further suspensions of small-scale and unregulated smelting plants in the future. The tightening of regulations on the molybdenum industry in China is believed to have benefited the larger producers in the country and to have strengthened the country's ability to control the increase in molybdenum production in the future.

On the demand side, domestic consumption of molybdenum grew at a CAGR of 18.6% between 2000 and 2005, based on the estimate of CNMIA. The increase in demand is correlated to the growth in the international and domestic steel industries. Domestic demand for molybdenum is expected to grow in excess of 15% per year in the next couple of years, driven by buoyant growth in demand for molybdenum from the steel industry in China, with respect to stainless steel and full-alloy steel in particular.

China has grown in both importance and size in the global steel industry. According to Roskill, Chinese steel output grew by an average year-on-year rate of 11.7% from 95 Mt in 1995 to 272 Mt in 2004, and became the largest in the world in 1996. Most of the growth took place after 2000. In 2004, it accounted for 26% of world steel production compared with 13% in 1995. Japan and the U.S. are the next largest, accounting for 11% and 10% of world steel output respectively, growing at rates of 1.6% and 0.9% per year, respectively, between 1995 and 2004.

The following table demonstrates the strong capacity growth in China's stainless steel industry in 2004 and 2005 as well as the forecast strong growth in 2006 and 2007. Global steel producers also have expansion plans in China by shifting some of their production facilities to China, in order to capitalize on the world's most rapidly-growing market as well as the low manufacturing cost in China.

China's stainless steel melting capacity by company, 2004 – 2007F (Kt)

	2004	2005	2006F	2007F
TISCO	1,000	1,000	1,000	2,500
Baosteel Shanghai No.1	720	720	1,440	1,440
Baosteel Shanghai No.5	150	150	150	150
North East Special Steel	150	150	150	150
Jiuquan Iron and Steel	—	300	300	300
Guangzhou Lianzhong	—	—	—	800
POSCO Zhangjiagang	—	—	—	600
Other State-owned	300	300	300	300
Non-State-owned	1,150	2,000	2,200	2,400
Total	**3,470**	**4,620**	**5,540**	**8,640**
YoY Growth		**33.1%**	**19.9%**	**56.0%**

Source: Roskill Molybdenum Economics Report

China's domestic molybdenum prices

China's domestic molybdenum prices are largely consistent with molybdenum prices in the international market. For example, the average domestic ferromolybdenum price in China during the period from January to November 2005 was US$36.3/lb, which was largely in line with average ferromolybdenum prices in the United States (US$37.3/lb) and Europe (US$36.0/lb) over the same period. There have been occasions where price differentials have existed between the domestic market and the international market, as a result of the influence of short-term supply and demand conditions in the domestic ferromolybdenum market. In the past, smaller producers of ferromolybdenum undercut each other in the domestic market, leading to weaker prices in the domestic market. However, as a result of the PRC Government's effort to shut down and clean up polluting and high energy-consuming mining operations, there have recently been occasions where the domestic ferromolybdenum price has been higher than the international ferromolybdenum price.

PRC Government policy towards the molybdenum industry and its effectiveness

A prevalent factor in shaping the global molybdenum industry has been the recent restructuring of the PRC molybdenum industry by the PRC Government.

In recent years, the PRC Government has been increasingly concerned with environmental problems caused by highly polluting and energy consuming industries. For the molybdenum industry in particular, the PRC Government has taken measures to shut down and clean up hundreds of small-scale molybdenum operations in the past few years in order to better protect the environment and reduce inefficient use of resources. Many small molybdenum operations in areas of Huludao and Qingtian have been ordered to suspend or shut down their operations. The measures taken by the PRC Government resulted in an overall reduction of molybdenum supply from China in 2005.

Starting from 2006, the PRC Government further strengthened its efforts to clean up small mining operations in areas such as Huludao, Luonan and Luoyang, and consolidation in the industry has been encouraged. The measures taken by the central government and various local governments are considered to be beneficial to the healthy long-term development of China's domestic molybdenum industry.

The PRC Government has been increasingly viewing molybdenum as a strategic metal. In addition to its strengthened effort to regulate small, inefficient and non-environmentally-friendly operations, the PRC Government, in order to increase its control over the production and export of molybdenum products, has also introduced various measures, such as the cancellation of value-added tax rebates for molybdenum exports in May 2005, the increase in resource tax on molybdenum mining in January 2006, the imposition of export tax on molybdenum products in November 2006, the introduction of export licensing regulations in January 2007 and the temporary adjustment of the valid period of the export licenses for molybdenum in March 2007. Recently, there has also been market speculation that an export quota system will be imposed on the export of molybdenum products from the PRC in the near future. However, it remains uncertain as to whether or when such export quota system will be introduced and, if so, what form it will take. The impact of such export quota system, including the impact on market prices for molybdenum in the PRC and other parts of the world, if implemented, is unknown. We cannot assure you that our financial condition and results of operations would not be materially and adversely affected should such export quota system be introduced and applied to molybdenum exporters such as us. Please refer to sections headed "Risk Factors" and "Regulatory Environment" in this prospectus for further details.

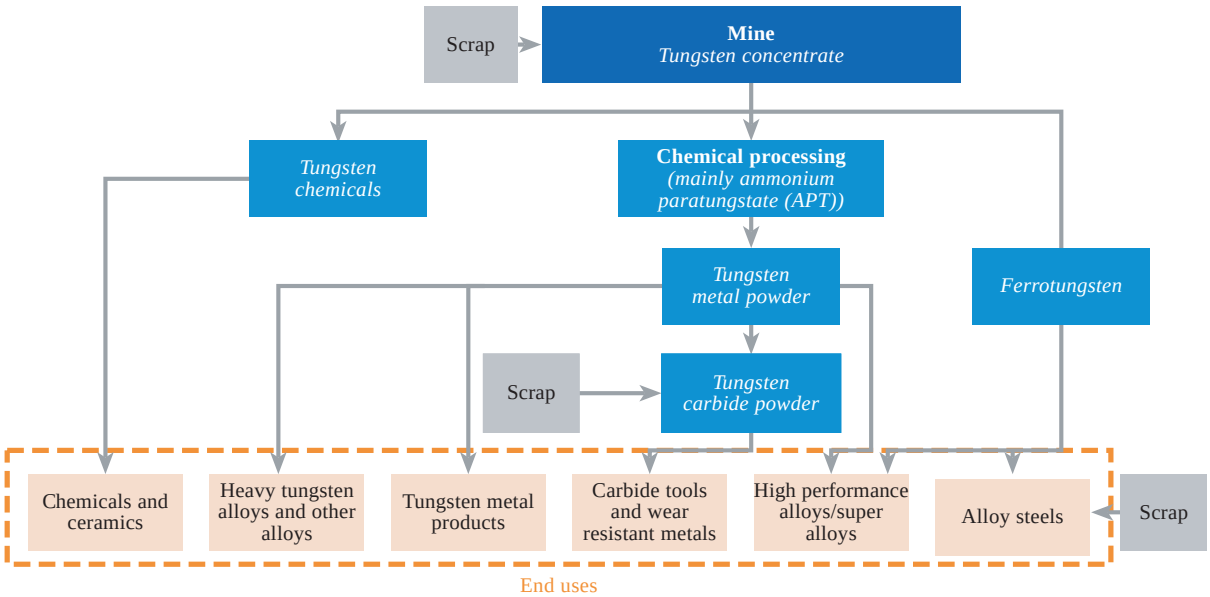
TUNGSTEN

Tungsten constitutes only 0.00013% of the Earth's crust. In its metallic form, tungsten is hard, brittle and grey-white in color, and is unusual in that its ductility increases with working. Tungsten is brittle at room temperature and in impure form, has a high specific gravity of 6.0 to 7.5, and a high melting point of 3,400°C. Tungsten products have a wide range of uses, the largest of which is as tungsten carbide in cemented carbides.

Tungsten is traded internationally in a variety of forms, from relatively unprocessed ore and concentrate to finished products such as tungsten wire filaments. In terms of volume, tungsten intermediates are the most important form of tungsten traded internationally. Chinese companies dominate world trade in tungsten intermediates and are growing in importance in terms of semi-finished and finished products.

Tungsten is principally consumed as tungsten carbide in cemented carbides, which accounted for 58% of world consumption in 2005 according to the estimates by Roskill. Globally, tungsten is mainly consumed as tungsten powder, tungsten metal powder, ferrotungsten and ammonium metatungstate. There are six main end-uses for tungsten, which in order of importance are cemented carbides, alloy steels, fabricated tungsten metal products, high performance alloys/super alloys, heavy tungsten alloys and other tungsten alloys, and tungsten chemicals.

Below is a simplified flow diagram for tungsten processing and end-use markets.



Source: Roskill Tungsten Economics Report

Roskill estimates world-wide demand for tungsten by application in 2005 as follows.

Estimated division of tungsten consumption by application, 2005

	%
Cemented carbides	58
Steels (tool, stainless and full alloy steels) and high performance/super alloys	17
Mill products	15
Other (tungsten chemicals and ceramics)	10
Total	100%

Source: Roskill Tungsten Economics Report

Cemented carbides, also called hardmetals, are wear-resistant materials used by the metalworking, mining and construction industries. Tungsten carbide exhibits extreme hardness and high resistance to abrasion. It also retains these properties up to very high temperatures. This has resulted in the adoption of tungsten as the main component of high performance cutting tools, and in carbides becoming the principal use of tungsten. Cemented carbides accounted for approximately 58% of world consumption in 2005 according to the estimates by Roskill.

Steel is an important end-use for tungsten. The steel sector represented around 17% of global tungsten consumption in 2005, as estimated by Roskill. Tungsten is used in tool, stainless and heat resistant steels, and full alloy steels, as well as super alloys. Tool steels account for around 85% to 90% of tungsten demand in alloy steels. Tungsten-based alloys are also a significant market for tungsten in this sector.

Mill products manufactured from tungsten metal, which are mainly used as filaments in the lamp industry and for electrical and electronic contacts, had a 15% share of the tungsten market in 2005.

Other uses, mainly chemical applications and products such as catalysts and pigments, accounted for the remaining 10% of world consumption in 2005 according to Roskill estimates.

The pattern of tungsten consumption varies sharply from country to country. Cemented carbides is the largest consuming sector for tungsten in all regions, but its share of the market ranges from 51% in China to 71% in Europe. Steel and alloys are proportionately more important in China compared with Europe, Japan and the United States. In the United States, tungsten mill products are relatively more important than in other industrialized countries, accounting for 41% of demand compared to 7% to 11% in Europe, Japan and China. By contrast, chemical and other applications have a greater importance in Japan, representing 17% of tungsten demand, compared with less than 6% in Europe and China and only 1% in the United States.

WORLD TUNGSTEN INDUSTRY

Tungsten reserves

In nature, tungsten occurs as an oxide (WO_3) and is present in more than 30 minerals. Scheelite and the wolframite minerals are the only commercially important tungsten minerals.

Tungsten deposits tend to be associated with granitic rocks, in particular pegmatites and hydrothermal veins, and occur in three main types of deposit: hydrothermal veins, skarns, and stratiform ores. Hydrothermal veins are by far the most important commercial deposit, accounting for over 60% of global economic resources of tungsten. Similar belts extend throughout Asiatic Russia.

There is a marked association between tungsten deposits and young mountain belts, e.g. Alpine-Himalayan and Circum-Pacific belts. Major tungsten deposits occur in the fold belts of the Far East, in southern China, Thailand, Burma, Korea and Japan.

According to the Roskill Tungsten Economics Report, the United States Geological Survey ("USGS") (which has not provided any commissioned report for the purposes of this prospectus) estimates global tungsten reserves at 2.9 Mt (contained tungsten) with the reserve base, including deposits currently classed as uneconomic, at 6.2 Mt as at 2005. Roskill estimates that identified reserves are sufficient for around a century of supply at current levels of production. China accounts for just over 60% of world reserves and nearly 70% of the global reserve base. Other countries with significant reserves of tungsten include Canada, the Commonwealth of Independent States ("CIS") and the United States. Most remaining reserves are located in Asia, with smaller, but nevertheless important, deposits in Europe, Latin America and Australia.

Tungsten reserves and reserve base by main countries, 2005 (Kt W)

Country	Reserves[1]	% of total	Reserve base[2]	% of total
China	1,800	62.1	4,200	67.7
Canada	260	9.0	490	7.9
Russia[3]	250	8.6	420	6.8
United States	140	4.8	200	3.2
Others	450	15.5	890	14.4
Total	2,900	100.0	6,200	100.0

Source: Derived from the data in the Roskill Tungsten Economics Report

Notes:

(1) That part of the reserve base which could be economically extracted or produced at the time of determination. The term reserves need not signify that extraction facilities are in place and operative. Reserves include only recoverable materials; thus, terms such as "extractable reserves" and "recoverable reserves" are redundant and are not part of this classification system.

(2) That part of an identified resource that meets specified minimum physical and chemical criteria related to current mining and production practices, including those for grade, quality, thickness, and depth. The reserve base is the in-place demonstrated (measured plus indicated) resource from which reserves are estimated. It may encompass those parts of the resources that have reasonable potential for becoming economically available within planning horizons beyond those that assume proven technology and current economics. The reserve base includes those resources that are currently economic (reserves), marginally economic (marginal reserves), and some of those that are currently subeconomic (subeconomic resources). The term "geologic reserve" has been applied by others generally to the reserve-base category, but it may also include the inferred-reserve-base category. It is not a part of this classification system.

(3) Roskill estimates that USGS's estimates probably overstate Russian reserves (250 Kt W) as they were not calculated in relation to market prices and as a result some reserves would be classed as uneconomic.

According to the Roskill Tungsten Economics Report, the International Tungsten Industry Association ("ITIA") estimates global tungsten reserves and reserve base lower than USGS at 7 Mt (contained tungsten).

World production and supply of tungsten

According to the Roskill Tungsten Economics Report, the ITIA considers that mined ore primary production accounts for around two-thirds of the global supply of tungsten, with secondary production from the recycling of scrap comprising the balance. Supplies from stockpiles have also played an important part in satisfying demand historically.

Primary production

Tungsten ore is usually mined by underground methods, with open-pit operations tending to be less common, as most tungsten is located in subsurface vein and skarn deposits. Once the ore has been crushed, standard gravity separation techniques can be used to recover the tungsten as tungsten concentrate. Flotation techniques are used to treat finer grades of scheelite but are rarely used for

wolframite recovery. Wolframite and scheelite concentrate is pre-treated before chemical processing to produce ammonium paratungstate (APT). Secondary raw materials, including residues and oxidized scrap, are also important feedstocks.

Tungsten concentrate typically contains 65% to 70% WO_3. However, fully integrated companies usually prefer lower grades (6% to 40% WO_3) consistent with the capabilities of their processing infrastructure. Concentrate historically has been the most commonly traded form of tungsten but has largely been substituted by APT. APT is both the main intermediate tungsten product and the most commonly traded tungsten raw material. All other intermediaries such as tungsten trioxide, tungsten blue oxide, tungstic acid and ammonium metatungstate can be derived from APT, either by thermal decomposition or chemical conversion.

Roskill estimates that world tungsten mine production reached 55,759t (contained tungsten) in 2005, representing a CAGR of 3.9% since 2000. World production is dominated by China, which accounted for around 84% of world mine production in 2005 estimated by Roskill.

Breakdown of world primary tungsten production by principal countries, 2000 – 2005 (t W)

Country	2000		2001		2002		2003		2004		2005	
China	39,300	85.3%	47,200	86.8%	35,700	77.8%	46,700	81.3%	44,000	85.9%	47,000	84.3%
Russia	3,013	6.5%	3,172	5.8%	3,489	7.6%	3,727	6.5%	2,815	5.5%	3,569	6.4%
Austria	1,421	3.1%	1,450	2.7%	1,380	3.0%	1,380	2.4%	1,340	2.6%	1,280	2.3%
Subtotal	43,734	94.9%	51,822	95.3%	40,569	88.5%	51,807	90.2%	48,155	94.0%	51,849	93.0%
World Total	46,094	100.0%	54,389	100.0%	45,860	100.0%	57,434	100.0%	51,206	100.0%	55,759	100.0%

Source: Derived from the data in the Roskill Tungsten Economics Report

The long period of low prices for tungsten has discouraged investment in global tungsten mining and exploration and as a result, a large number of western tungsten producers have exited the market. However, the rise in prices during 2005 led to the reopening of the Cantung mine in Canada. Small operations opened in Mongolia in 2005 and Peru in 2006. In addition, there are a number of projects in varying stages of development, especially in Australia. Roskill considers the most likely of these to reach commercial production is the King Island mine, which is expected to commence production in 2007. The most significant development outside China is the Nui Phao project in Vietnam.

Secondary production

The principal form of secondary tungsten production is tungsten recycling from waste and scrap, particularly tungsten carbide. The rate of recovery of scrap tends to be related to prices for cobalt, the other main material in tungsten carbide products and a valuable co-product in tungsten recycling. When cobalt prices are low, recycling scrap to recover tungsten is less viable and more primary tungsten is used. Scrap is then accumulated until cobalt prices rise to levels that make recycling economically viable.

The rise in world tungsten prices has made recycling of waste and scrap increasingly attractive. World exports grew from around 6.0 Kt in 2002 to over 10.7 Kt in 2005. Most scrap is exported from the industrialized economies of Germany, Japan, the UK and the United States. Recorded imports of waste and scrap had grown more rapidly than those of exports as not all of these are reported. The main imports are into Germany, the UK and the United States.

Government stockpiles

A major factor in the market in recent years has been the disposal of the Russian tungsten stockpiles. However, Roskill expects that supplies from stockpiles are likely to become of declining importance partly because Russian stocks appear to be exhausted and releases from the United States strategic stockpile are strictly regulated.

Releases by Gosreserv were one of the main reasons that tungsten prices have struggled to recover in the recent past. However, exports of tungsten from Russia by Gosreserv in particular, have fallen steadily since 1997, which would seem to suggest that the volumes of tungsten in the stockpile are significantly reduced or that Gosreserv is waiting for higher prices before releasing any more material.

The United States Defense National Stockpile (DNS) contains large amounts of tungsten, mainly in the form of tungsten ore and tungsten concentrate. The amount of material held by the DNS is falling as the United States government has a policy of no longer holding strategic materials. Sales by the Defense Logistics Agency (DLA) restarted in 2000 and the DLA has been authorized to sell over 3.7 Kt of contained tungsten in the year to September 2007. Roskill expects that the DLA is likely to continue offering this amount for sale in the foreseeable future, although it is possible that the DLA could request to sell more if required by the market or if tungsten prices rose sufficiently.

World consumption of tungsten

Demand for tungsten primarily comes from its use in cemented carbides. Roskill estimates the use of tungsten in cemented carbides accounted for approximately 58% of the world's total consumption of tungsten in 2005.

There have been very few new applications for tungsten in recent years, with most of the end-use markets for tungsten being relatively mature. As a result, world consumption of tungsten has tended to follow a similar trend to general economic activity. However, the global market for primary tungsten (i.e. excluding recycled scrap) is estimated to have grown from approximately 45.1 Kt contained tungsten in 2002 to an historical high of 60.5 Kt contained tungsten in 2005, at a CAGR of 10%. This compares with an average world real GDP growth rate of around 3% per year from 2000 to 2005. Much of the growth has been in Europe and China, followed to a lesser degree by growth in the other main consuming regions.

World consumption of tungsten by region, 2000 – 2005 (tonnes contained tungsten (t W))[1]

Country/Region	2000	2001	2002	2003	2004	2005	CAGR (2000 – 2005)
China	14,400	16,550	19,000	18,950	19,450	23,150	10.0%
Europe	12,350	17,600	8,050	15,150	11,700	16,150	5.5%
United States	8,950	9,700	8,300	8,850	7,400	8,800	(0.3)%
Japan	8,000	6,850	5,450	5,950	7,150	7,950	(0.1)%
World Total	48,200	55,000	45,100	54,100	50,700	60,550	4.7%

Source: Roskill Tungsten Economics Report

Note:

(1) Consumption in the CIS and North Korea is not known and is excluded

China is now the largest consumer of tungsten in the world having overtaken Europe in 2002. In 2005, Chinese demand for tungsten accounted for over 38% of the total world demand compared to under 30% in 2000. The two other main countries with significant tungsten consumption are Japan and the United States.

Consumption of secondary material in the form of scrap is significant in some countries, especially in Europe and the United States. The amount of scrap recycled is not generally available; however, based on estimates by Roskill, the amount is typically an average of 25% to 30% of mined production consumed.

International trade in tungsten

The PRC Government's policy to add value to exports of metals and minerals, including tungsten, has gradually led to the cessation of shipments of less processed forms of tungsten (such as ore and concentrate) and a move to higher value tungsten products, such as intermediates, semi-finished and finished products. Roskill expects that this trend is likely to continue as Chinese tungsten producers move further down the processing chain, producing and exporting higher volumes of downstream tungsten products.

In this regard, in terms of volume, tungsten intermediates are the most important form of tungsten traded internationally. These include tungstates, such as APT and sodium tungstate, tungsten oxide and hydroxide, and ferrotungsten. Chinese companies dominate exports of tungsten intermediates. In 2005, Chinese exports accounted for almost 68% of the world total of tungstate, tungsten oxides and hydroxide, and ferrotungsten combined.

The main tungsten processing countries are also the leading importers of intermediates. The largest imports in 2005 were into Switzerland, Japan and the United States, accounting for 29%, 25% and 20% of the recorded total, respectively. Other significant imports were into Germany and the Netherlands.

Tungsten prices tend to be quoted in either metric or short ton units of WO_3, which is the equivalent of 1% of a metric or short ton. This is therefore the equivalent of 20 lb of WO_3 in the case of short ton units, which contains 15.86 lb of tungsten, or 10 kg of WO_3 in the case of metric ton units, which would contain 7.93 kg of tungsten.

Tungsten is not traded on any exchange, therefore no terminal or futures market exists for tungsten products where producers, consumers and traders can fix an official or settlement price. Price information based on information elicited from producers, consumers and traders is published by trade journals. As a result of the lack of transparency, the prices published are viewed by market commentators and participants as an indicator of tungsten price trends over time, rather than as an accurate indicator of the tungsten price at a specific point in time.

World production, consumption and prices of tungsten in recent years

The average monthly Chinese APT price fluctuated between US$47/mtu to US$97/mtu between 1998 and 2004. Growth in demand combined with lower availability of Chinese material saw annual average APT prices more than double in 2005 to an average of US$218/mtu, with an average APT price of US$255/mtu in December 2005. APT prices remained at this level in 2006 with the average monthly price for 2006 being US$253/mtu. Set out below is a chart showing the world's tungsten production and consumption as well as tungsten price, measured by annual average median APT price between 1998 and 2005:

World production, consumption and prices of tungsten 1998 – 2005(1)

Source: Roskill Tungsten Economics Report

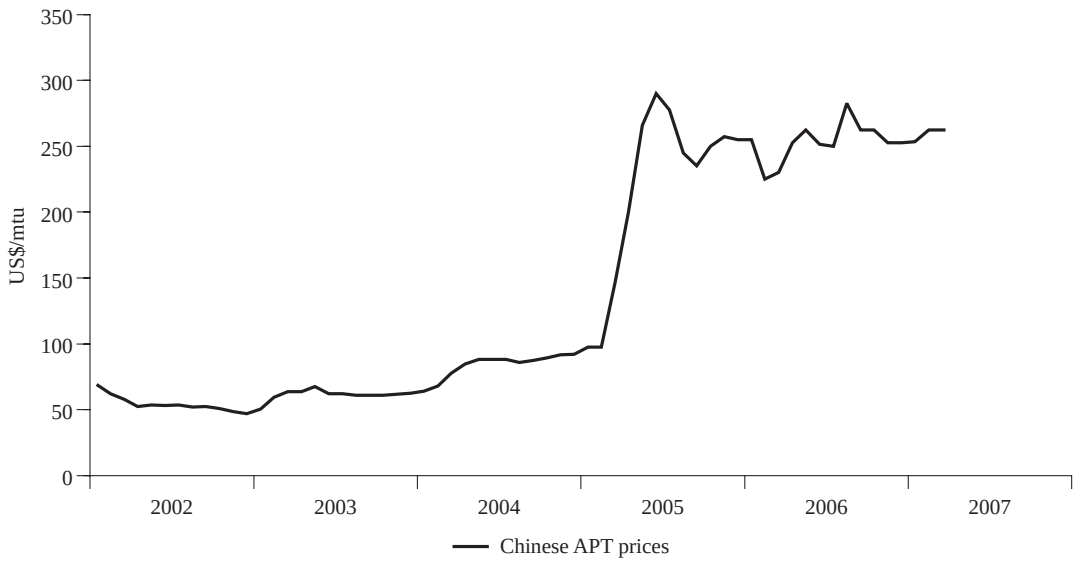
Note:

(1) Prices based on Chinese APT prices.

Historically the balance between supply and demand in the tungsten market has been dependent to a great degree on the ability of the PRC Government to exert control over its domestic tungsten production industry (as an increase in tungsten prices has historically led to additional production in China in contravention of official production quota). However, a 25% rise in global consumption as a result of general economic activity in the period from 2002 to 2005, compared to a 20% growth in primary production of tungsten over the same period led to a sharp increase in tungsten prices during 2005 and 2006.

The monthly median Chinese prices for APT from January 2002 to March 2007 are set out in the chart below:

Chinese APT prices (January 2002 – March 2007)



Source: Derived from the data in the Roskill Tungsten Economics Report, updated to March 2007

Tungsten prices almost trebled in the first half of 2005, partly due to the entrance of speculators into the market, although most of the increase was attributable to a shortage of tungsten production from China as a result of stricter regulatory measures by the PRC Government. Tungsten prices dropped back slightly in the second half of 2005, but rose again in the first half of 2006 to close to their peak in 2005. A major reason for this was that in May 2006, the PRC Government launched a campaign to shut illegal mines in Jiangxi, Hunan, Sichuan and Guangdong, which resulted in a material decrease in the nation's production of tungsten concentrate.

Low tungsten prices over the last decade have discouraged companies from investing in projects outside China. However, the sustained period of high prices has stimulated interest in a number of tungsten projects outside China that are at various stages of development. Whilst Chinese output still accounted for over 80% of global primary production in 2005, Roskill expects this to decline as existing mines with rich tungsten deposits in many areas of the country are exhausted and potentially are not replaced or replaced with mines extracting lower grade ore.

World tungsten industry outlook

Roskill expects the tungsten market to remain dependent on the ability of Chinese authorities to continue to introduce measures designed to control the domestic tungsten production industry. This is being aided by rising domestic consumption, which is a major reason that Chinese exports have not kept pace with rising global consumption in recent years. Roskill expects future prices for tungsten to continue to be dictated by a combination of supply-side factors and rising demand.

The ability of the supply side of the market to react to increased demand for tungsten is limited, particularly in western countries. The long period of low prices for tungsten has discouraged investment in global tungsten mining and exploration and, as a result, a large number of western tungsten producers have exited the market. Roskill estimates that by 2008, 6.7 Kt of contained tungsten capacity, or approximately 12% of mine production in 2005, could be in operation from new projects outside China, especially in Australia. This increase in mine production is expected to be somewhat offset by declining mine production in China as a result of further mine closures and as existing mine reserves become depleted due to a lack of investment in the development and exploration of new reserves and deposits in the country.

Secondary tungsten production, from scrap recycling, is expected to play an increasingly important role in the supply of tungsten in response to sustained high prices. According to Roskill, some estimates put the use of tungsten scrap in some countries as high as 30%. The incentive to use scrap increases as prices for tungsten and cobalt (the other main material in tungsten carbides) rise. Roskill expects that supplies from stockpiles are likely to become of declining importance partly as Russian stocks appear to be exhausted and releases from the United States strategic stockpile are strictly regulated. The DLA in the United States holds over 26.0 Kt contained tungsten in forms including tungsten ore and tungsten concentrate. Regulations allow for sale of a total 3,765t contained tungsten from the U.S. strategic stockpiles from 2000 to September 2007, indicating that at this rate of sale, strategic disposals will be an important factor in the tungsten market for at least the next decade.

Roskill expects that new capacity coming onto the market over the next three to four years will be enough to meet expected rising demand. Demand for tungsten is forecast to grow by an average of 3% per year to 2008 when it would reach 66.0 Kt contained tungsten, largely because of the growing use of cemented carbides. Overall growth in the hardmetals market has mirrored economic growth and is expected to do so in the future. The hardmetals market is expected to grow at 4% per year. Roskill expects the steel and super alloy industries to provide moderate growth in demand for tungsten in the period to 2008, with tool steels remaining the most significant end-user in this sector. Roskill expects tool steel production to grow at around 2% to 3% per year to 2008.

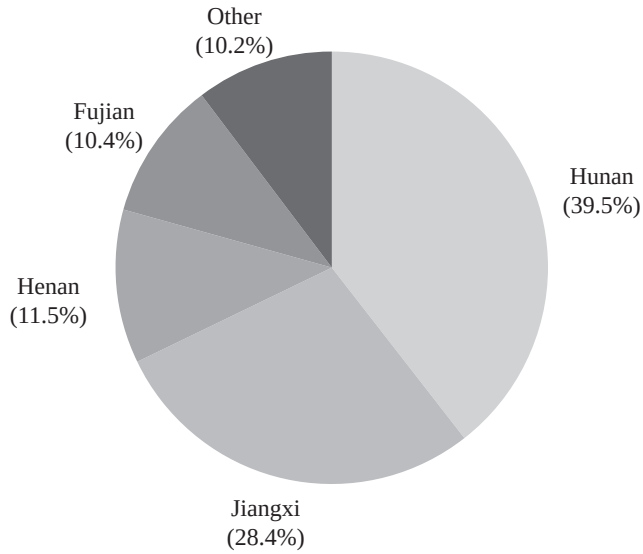
Roskill therefore expects the market for tungsten to remain relatively tight in this period, with prices expected to remain at or above current levels to 2008.

CHINA'S TUNGSTEN INDUSTRY

China's tungsten reserves

According to the Roskill Tungsten Economics Report, China's official tungsten reserves, measured by tungsten trioxide (WO_3), were estimated to be over 1.4 Mt WO_3 as at 2003.

Reserves are mainly located in the provinces of Hunan, Jiangxi, Henan and Fujian, which together account for almost 90% of the nation's total reserves.



Source: Derived from the data in the Roskill Tungsten Economics Report

Over 90% of the nation's 12.2 Mt annual tungsten ore mining capacity in 2003 was located in three provinces (Jiangxi, Hunan and Guangdong). Scheelite is the principal form of mineralogy and accounts for approximately 71% of total reserves. Whilst wolframite accounts for approximately 28% of the nation's reserves, it represents around 90% of domestic production. Advances in processing technology are leading to greater mining of scheelite deposits for the extraction of tungsten.

China's tungsten export and import

China is the dominant supplier of tungsten products to the world, and is itself the largest market for tungsten. China's main exports are in the form of intermediates, which include tungstate, tungsten oxide and ferrotungsten, and together accounted for around 80% of exports in 2005. China's import is mainly tungsten concentrate, which accounted for 91% of tungsten product imports in 2005.

China's supply and disposal of tungsten products, 2001 – 2005

Tonnes W	2001	2002	2003	2004	2005	CAGR (2001–2005)
Domestic consumption	13,967	15,116	17,000	18,631	20,000	9.4%
Exports	26,416	23,050	29,674	30,292	33,806	6.4%
Imports[1]	1,258	2,269	1,812	3,479	6,761	52.3%

Source: Derived from the data in Roskill Tungsten Economics Report

Note:

(1) Unit is tonnes gross weight.

Chinese exports of tungsten products grew at a CAGR of 6.4% between 2001 and 2005. Quota products exceeded official limits in 2003 and subsequent years. In 2005, Chinese companies accounted for 79% of world exports of tungstate, 79% of exports of tungsten oxide and 46% of exports of ferrotungsten. Shipments of tungsten carbide have grown steadily and by 2005, Chinese companies accounted for almost 50% of global exports compared to 34% in 2000. Chinese exports of downstream products have also grown steadily in recent years as Chinese producers are processing increasing amounts of intermediates into downstream products, such as tungsten metal, carbide powder and metal products. This has resulted in Chinese exports of downstream tungsten products growing from a negligible amount in the early 1980s to approximately 12% in the period 2000 to 2005.

Primary tungsten export quota, 2002 – 2007

Tonnes	2002	2003	2004	2005	2006	2007
Primary tungsten	18,100	17,400	16,300	16,300	15,800	15,400

Source: Roskill Tungsten Economics Report

According to the Roskill Tungsten Economics Report, the PRC Government has attempted to control the domestic tungsten industry through a system of production allocations. In addition, export quota have also been placed on tungsten products. Export quota were reduced from 18.1 Kt contained tungsten in 2002 to 15.8 Kt contained tungsten in 2006. Roskill expects Chinese export quota to further reduce to 15.4 Kt contained tungsten in 2007.

The PRC Government has encouraged exports in the past by a series of value-added tax rebates but has been reducing these since 2005. On May 1, 2005, the value-added tax rebate for primary tungsten exports was reduced from 13% to 8%. Effective January 1, 2006 the value-added tax rebate was further reduced from 8% to 5%. In September 2006, the 5% tax rebate on the export of APT was cancelled. All value-added tax rebates on primary tungsten exports will be withdrawn in the near future. In October 2006, the PRC Government announced that the interim export duty rate on some tungsten products would be adjusted as from November 2006. Exports of ferrotungsten now attract a duty of 10% and those of tungsten scrap, 15%. This is part of the policy to reduce exports of less processed products.

Historically, the ability of the PRC Government to effectively control the amount of material exported has been the main factor influencing the stability of the tungsten market. More recently, a reduction in export quota and rising domestic demand has seen world prices reach record levels and a growth in Chinese output. However, the PRC Government has been able to exert more control over exports than in previous periods when prices have been high.

Chinese imports of tungsten concentrate rose to over 6.0 Kt in 2005 compared to only 563t in 2000. The increase in domestic and foreign demand for tungsten led to a shortage of tungsten concentrate in 2003 that became chronic in 2005. The use of secondary material, such as recycled scrap is growing as a means to close the supply gap. In 2005, 8.0 Kt of secondary tungsten was consumed in China, equivalent to 15.6 Kt of tungsten concentrate. In 2005, most imports into China originated in Russia (1,617t), North Korea (1,252t), U.S. (619t), Vietnam (461t) and Thailand (437t).

China's tungsten supply and consumption

Chinese producers are the main source of tungsten for the world market, accounting for around 84% of world supply in 2005. According to the ITIA, Chinese demand for tungsten accounted for approximately 38% of the world market in 2005.

On the supply side, the majority of Chinese tungsten is produced in the form of tungsten concentrate, APT and more recently tungsten powder; however, as mentioned earlier, production of more processed forms has been growing in recent years.

Production of main tungsten products, 2000 – 2005

Tonnes	2000	2001	2002	2003	2004	2005
Concentrate	45,417	53,903	69,952	70,216	85,378	73,403
APT	31,100	30,349	26,133	45,838	54,762	51,800
Tungsten powder	3,800	8,224	5,088	12,916	22,081	20,600
Cemented carbide	8,171	9,848	11,268	11,670	16,755	15,100
Ferrotungsten	10,900	10,301	9,163	10,787	11,082	11,100
Tungsten wire[(1)]	7.66	10.67	13.02	14.13	18.30	29.00

Source: Roskill Tungsten Economics Report

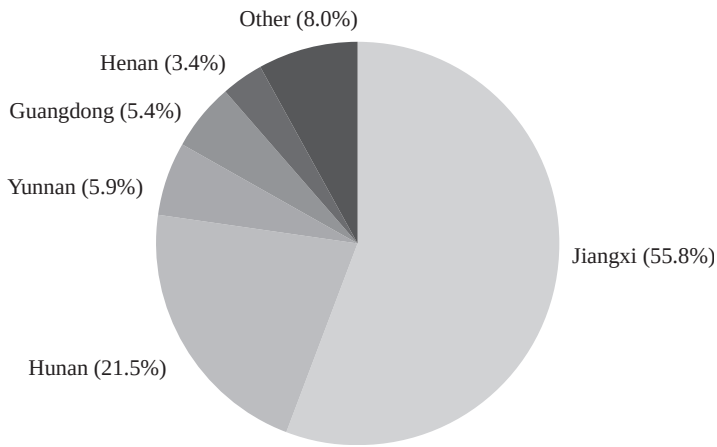
Note:

(1) Unit is billion meters.

Chinese producers, many of which are State-owned, dominate the global supply of tungsten. Tungsten mine production is mainly located in the Jiangxi, Hunan and Guangdong provinces, which together accounted for over 90% of the nation's mine capacity in 2003. According to the Roskill Tungsten Economics Report, the ITIA considers that there were 116 active mines in China during 2005 producing 52.0 Kt contained tungsten compared to 43.7 Kt contained tungsten in 2004 and 43.7 Kt contained tungsten in 2003. A high proportion of Chinese tungsten mines have been in operation for many years and are approaching exhaustion. Production of tungsten concentrate in the period of January to August 2006 was largely carried out in the provinces of Jiangxi and Hunan, which together accounted for around 85% of the nation's tungsten concentrate production.

The annual quota for exploitation of tungsten concentrate in the PRC has been set to be 59.1 Kt for 2006. The production quota for 2006 by province are summarized in the chart below.

PRC tungsten concentrate production quota by province, 2006



Source: Roskill Tungsten Economics Report

Roskill expects Chinese production in 2006 to be lower than that in 2005 due to the occurrence of natural disasters in Jiangxi and Hunan provinces in July and August 2006. A campaign by the PRC Government to shut illegal mines in Jiangxi, Hunan, Sichuan and Guangdong provinces is also expected to reduce output. The PRC Government suspended 31 illegal tungsten mines in Ziyuan County of Guangxi in 2006. However, production of tungsten concentrate in the nine months to September 2006 was reported at 59.3 Kt (at 65% WO_3), a rise of around 8% compared to the same period in 2005.

The Chinese tungsten industry comprises a range of companies from fully integrated producers to those using raw materials from mining and processing companies to manufacture finished products, such as carbide and wire. As the PRC Government continues its environmental protection efforts, there could be further suspensions of small-scale and unregulated mining operations in the future. According to the Roskill Tungsten Economics Report, reorganization of the industry has led to the emergence of five large State-owned producers; China Minmetals, Hunan Nonferrous Metals, Jiangxi Tungsten Industry Group, Xiamen Tungsten and Zhuzhou Cemented Carbide. Together these companies produce over 30,000 tonnes per annum of tungsten concentrate, 52.0 Kt per annum of APT and 20.8 Kt per annum of tungsten powder.

On the demand side, domestic consumption of primary tungsten grew at a CAGR of 9.4% between 2001 and 2005, based on the estimate of Roskill. Roskill expects Chinese consumption of primary tungsten to reach 20.0 Kt contained tungsten in 2005, which is a 7% increase on consumption of 18.6 Kt contained tungsten in 2004 according to the ITIA.

In 2005, around half of primary tungsten was used in carbide alloy with the remainder consumed in special steels as ferrotungsten (30%), finished products (13%) and chemicals (6%). Domestic production of ferrotungsten is a major use for tungsten concentrate, accounting for up to one third of Chinese domestic demand for tungsten concentrate. Output of ferrotungsten tends to fluctuate in line with exports of material. Chinese exports of ferrotungsten increased from 5.1 Kt in 2000 to 6.7 Kt in 2004, before falling back to 6.0 Kt in 2005.

China's domestic tungsten prices

The importance of intermediate tungsten products, particularly APT, has grown so that the APT price has become more representative of price trends in the tungsten market. As the largest single component of global supply, with approximately 9.0 Kt exported in 2005, the price of Chinese APT is an important measure of tungsten price. Exports of ferrotungsten from China are also important, with 6.0 Kt of ferrotungsten exported in 2005. Hence, prices of Chinese ferrotungsten are also a relevant measure of tungsten price.

The annual average domestic APT price in 2005 was US$218/mtu, which was largely in line with the annual average APT prices in the U.S. (US$215/mtu) and Europe (US$221/mtu).

PRC Government policy towards the tungsten industry and its effectiveness

The PRC Government is taking steps to rationalize the nation's tungsten industry, with efforts to shut down and clean up mining operations with heavy pollution and high energy-consumption and the imposition of production quota. Provincial governments have also shown a greater willingness to reduce illegal mining in recent times. In addition, the introduction of an export licensing system and a number of other measures, including removal of value-added tax rebates, increases in the cost of obtaining export quota, imposition of mining quota and the imposition of export taxes, have been introduced to control the supply of tungsten products to the world market.

These measures are having increasing success as the amount of unlicensed/illegal material produced is falling and less tungsten is exported outside the official export license system.

Chinese producers accounted for over 80% of world tungsten supply in 2005. There is a flourishing entrepreneurial private sector comprising mainly very small tungsten mines, which operate with minimal official sanction and scant attention to safety or environmental issues. These producers have been able to raise output and exports in response to rises in global prices, which, in effect, has held global prices down and led to the gradual closure of operations outside China.

In 2006, the PRC Government announced that 31 illegal tungsten mines in Ziyuan County of Guangxi had been closed. Additionally, the PRC Government announced that effective January 1, 2006, export tax rebates on tungsten products would fall from 8% to 5% and in September 2006, announced the cancellation of the 5% tax rebate on the export of APT. The export quota was also reduced from 16.3 Kt contained tungsten in 2005 to 15.8 Kt contained tungsten in 2006.

However, according to Roskill, the PRC Government's control initiatives received only limited success. Roskill estimates that there are still approximately 116 active tungsten mines operating in China, most of which produce less than 200 tpa of tungsten concentrate each. Moreover, as tungsten prices increase, illegal or unlicensed mining activities have increased and more tungsten materials are exported outside the official licensing system.