The Turning of the Dragon
China in change: domestic demand priority

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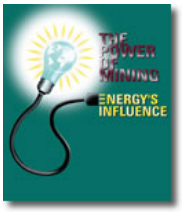
Since the 1980s, China has become the world's leading producer and exporter in a range of important industrial minerals, notably including barite, bauxite, brown fused alumina, fluorspar, graphite, magnesite, silicon carbide, refractory clays, talc, and wollastonite. Global markets and prices for these and other minerals have been influenced not only by China's mineral production and exports, but also by the country's various administrative developments such as resource tax, and the export license system.

However, the last few years have witnessed profound changes in the "China effect", primarily owing to the continuing boom in China's domestic industry and markets. This has led to increased demand for minerals *within* China, and together with certain other influencing factors, has created tightness in supply for its mineral exports.

This paper highlights the trends and developments that have modified China to become a major producer *and* consumer of industrial minerals, and points to potential opportunities for overseas producers to regain some market share, and perhaps engage in supplying China itself.



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Then and now – in a nutshell, China's mineral trade to 2007

Without doubt the dominant factor affecting industrial minerals supply and markets since the early 1990s has been China. With its opening up to the world market in 1978, the country has never looked back, and within just 25 years has evolved from a leading supplier of industrial minerals for world markets to a leading consumer *and* supplier of minerals.

China has had a momentous effect on international trade of industrial minerals. The market growth of China and East Asia superbly illustrates the influence of new consuming market development on mineral trade routes. Key minerals with which China bangs the world-trade drum include bauxite, barite, fused alumina, fluorspar, silicon carbide, flint clay, graphite, magnesite, talc, and wollastonite (see accompanying tables).

Initially, during the mid- to late 1980s, China started to dominate world supply in these minerals, frequently triggering antidumping duties with its low-cost exports. In the early years, Chinese minerals were not only low cost but also rather inconsistent in quality, often leading to insurance claims. This quality problem was mainly a function of outdated mineral processing equipment and techniques, a lack of independent inspection procedures, and an unstructured minerals industry that was ignorant (wittingly and unwittingly) of the risks of mixing and matching material from different sources for a single shipment.

The majority of China's mines and minerals trade were under the management of huge, unwieldy state owned enterprises, active in both mining and trading, headquartered in Beijing and operated through provincial subsidiaries, such as Minmetals, China Metallurgical Import/Export Corp., China Metallurgical Mines Corp., China National Non-metallic Minerals Industry Corp. (Group).

This was a gamble that consumers in the West had to take, and many, but not all, did. In the meantime, Western minerals producers would focus on maintaining customers by supplying quality-consistent, high-purity grades, but could do little about the low prices of Chinese material. The early 1990s—with the Asian Tiger economies in full swing (albeit temporarily stalled by the financial crash of 1997)— saw a major shift in minerals-consuming manufacturing centres to East Asia. Refractories, foundry, steel, ceramics, glass, paper, paint, and plastics markets were all developing rapidly (but, at least to begin with, at a slower pace in China itself).

Leading Western manufacturers in these sectors began to set up joint-venture plants to serve these growth markets. Chinese minerals soon began to supply these East Asian countries in addition to the Western developed countries. At the same time, Western mineral companies, traders, and entrepreneurs began to establish themselves in China and Southeast Asian countries to secure and develop raw material sources to feed these markets.

The mid-1990s also witnessed a significant change in China's mineral exports in that minerals were now being exported as semiprocessed or processed materials—adding value to the exports (until now being mostly crude lump ores) and meeting customers' requirements before shipping. This was enabled by the growth of foreign-owned minerals processors located at or near the main Chinese ports (eg. Xingang at Tianjin, and Zhanjiang, in Guangdong), guaranteeing Western standard processing and quality controls and minimizing the problems of inconsistent sourcing of raw material.

Not surprisingly, this trend also competitively impacted Western traders and processors located at ports in Europe, which were used to handling and treating imports of crude material from China before distributing to customers. They now had major competition.

The emergence of Western minerals inspection companies allowed to operate independently in China, such as SGS and Alfred H. Knight, also greatly facilitated the increase in quality of China's mineral exports.

Of critical importance was the introduction of controls on export prices and volumes by China's central government in 1994, which had an immediate and lasting effect on minerals trade from China (see later).

By the start of the new millennium, China's economy was starting to take off. Private mining enterprises were allowed to flourish, Chinese minerals producers (and end-product manufacturers) were operating with imported technology and equipment, overseas companies could run wholly owned operations in China, foreign investment increased, and the China trading outpost of Hong Kong became redundant as Shanghai, Dalian, Tianjin, Zhangjian, and Qingdao became the trading hubs of modern China and welcomed overseas businesses.

The result was that Chinese minerals supply to the world market increased in quality as well as quantity, and Western minerals producers, until now able to offset their higher prices with the promise of better quality grades, were now being squeezed out.

This was no better exemplified than in the magnesite market, where Western and East Asian refractory producers were able to substitute Western high-purity, dead-burned magnesia supplied with lower-cost fused magnesia from China. This caused Western producers to rethink their grade portfolios and prompted the exit of some big names in magnesia (and fused alumina) in the West and in Japan (eg. Magnesia – Britmag, UK, Sardamag, Italy, Harbison-Walker, USA, Asahi Chemical, Japan; fused alumina – Showa Denko, Japan, UCM, UK). China was all dominant.

By early 2005, China's economy was growing at 9.5% per annum (in spite of efforts to cool it down), and 2007 is forecast to see 10% growth. But in 2003–2004, China's soaring market growth triggered a major shift in world minerals trade. Although China will remain an important exporter of industrial minerals, its ravenous domestic consuming markets – in particular steel, non-ferrous metals, refractories, cement, glass, ceramics, paper, paint, plastics – became the priority for China's minerals producers, as opposed to the hitherto lucrative export market.

The incentive to export raw material simply became less attractive, and has been replaced by the incentive to export lower-cost finished products such as refractories and ceramics – the "second wave" if you like, and yes, like Chinese mineral exports in the 1980s-90s, these products have also now fallen foul of antidumping laws, eg. Chinese MgO-C refractory bricks into the EU in 2005.

Moreover, the Chinese government has taken formal steps to conserve its mineral resources, such as reducing mineral export volumes, abolishing export tax rebates, and initiating additional export taxes. Together with the high cost of ocean freight, this has prompted a major shortage of Chinese sourced minerals worldwide. High domestic market demand, limited energy sources, and rising costs, plus a creaking internal freight network, have all contributed to a major increase in Chinese minerals prices.

As a result of this, Western minerals producers have become very much in demand to fill the gap left by Chinese suppliers, and the pattern of mine-to-market supply has swung yet again.

Government influence

Key to the outlook for China's minerals industry, in terms of both domestic mining and trade, is the role played by the government.

Export licenses

This initiative is unique to China but has transformed the trade in certain minerals from China to the West. China's central government, through the China Chamber of Commerce of Metals, Minerals & Chemicals Importers & Exporters (CCCMC), implemented its export license system in

April 1994. The move was largely to enable stricter control of export volumes and prices, reduce smuggling, and minimize allegations of dumping. Although initially focused on magnesite and fluorspar, by 2007 export licenses were also required for exports of talc, silicon carbide, bauxite, and brucite.

The concept of the Chinese export license system is generally sound, even if it means that traders and overseas consumers, having enjoyed relatively low-cost Chinese minerals for a decade or so, now have to accommodate a higher price tag. The problem for the market, however, has been in the administration and subsequent modification of the system's rules and regulations on an almost annual basis, and with little or no consistency.

For example, in 2004, bauxite exports were subject to a flat fee of RMB230 (US$28)/t, but in 2005 the system changed to the notorious bidding and quota system, as used for magnesite exports. In this procedure, suitably qualified parties (i.e., those with a stipulated past record of exporting) bid to secure a limited number of export licenses and volume quotas set for the year's total exports.

Officially, those unsuccessful in securing export licenses cannot therefore export, and those that have export licenses but fail to fulfil them are subject to a penalty fee and relinquish their right to bid in the following year. In reality, an underground market for export licenses develops, and inevitably there is some collusion in bidding among prospective exporters.

Concerning magnesite exports, there have been at least five successive versions of an exporters' syndicate since 2000, each with laudable aims but lasting only a few months to a year before breaking up over disagreements on prices and procedures or because of apathy. The magnesite export associations have generally tended to increase the price of exported grades.

Smuggling also has become a problem, with unqualified exporters either doctoring export documents (eg. talc being exported as "chlorite") or exporting via "third" ports in China or South Korea. Any smuggled shipments of bauxite or magnesite that are suddenly confiscated or impounded by the Chinese authorities naturally have a major effect on waiting consumers overseas.

A very frustrated and confused trading community has been trying to keep up to date with the continually changing export license system and its disruptive impact on prices and material availability. In 2005, in its efforts to conserve its raw material resources, the Chinese government issued reduced export quotas of certain minerals such as bauxite and increased its prices. Although this disrupts supply of minerals from China, it does give impetus to overseas producers to plug the gap with their products.

Resource tax

In addition to export taxes, China has implemented a "resource tax". According to the China Non-metallic Minerals Industry Association (CNMIA), this can be defined as the volume of mineral ore sold x unit tax rate. CNMIA quotes unit tax rates as ranging RMB0.5-20/t ($0.06-2.5/t). However, magnesite mined in Liaoning province has seen rates range approximately US$10 to $40/t.

Abolition of tax rebates

Removal and reduction of tax rebates on mineral exports is another issue that has ramifications in world minerals trade. In October 2003, China announced reductions or cancellations of a range of mineral exports, including bauxite, silicon carbide, BFA, magnesite, fluorspar, talc, rare earths, graphite, and barite. Rebates ranging from 13% to 17% were cancelled or reduced to 5%. For most minerals exporters, this resulted in at least a $2/t increase in prices.

Further export taxes

Exporters and overseas consumers of Chinese minerals were dealt a further blow in November 2006 with the Chinese government's latest move to discourage exports. In an effort to curb its trade surplus, protect resources, minimise energy consumption, and environmental pollution, China's Ministry of Finance adjusted the customs duty rate, effectively an export tax, of 110 commodities, including certain industrial minerals.

The new measures included the imposition of a 10% tariff on the export of a range of rare earth mineral products (such as cerium compounds), andalusite, kyanite, sillimanite, mullite, apatite, fluorspar (<97%CaF_2 and >97% CaF_2), natural micaceous iron oxide, metallurgical bauxite, titanium minerals, and zircon and mineral sands. It is feared that this is the shape of things to come regarding all exported minerals from China.

Typical of such Chinese trade measures of late, the new rates came into force on 1 November, just one day after the government's announcement. The policy is expected to rein in exports which rely heavily on energy and resources, while encouraging their import.

This announcement was followed by another stating that a 10% export tax would levied on magnesite and magnesia exports effective 1 January 2007. This created a flurry of "material grabbing" by exporters to beat the deadline, which appears to have been extended to 1 March 2007, following the Chinese New Year celebrations.

All told, these tax impositions have resulted in consequent price rises faced by exporters. Any profit margins for exporters already under pressure from rising energy costs look to be squeezed further. As one veteran Chinese trader explained: "I feel that once the Chinese government is introducing a new tax to curb the export of minerals, obviously they do not worry about the competitiveness of Chinese minerals in the international market any more. As RMB will continue to appreciate against USD, the overseas buyer will either be forced to pay a significantly higher price for Chinese minerals or buy from an alternative source."

Antipollution legislation

The government has been active in imposing a range of environmental measures on industries including the minerals sector, such as dust-collection equipment becoming compulsory and other measures like emission control becoming stricter. This has created a new generation of cost implications for Chinese mineral producers.

Recent years have also seen a vast reduction in shaft and round kiln calcined bauxite production (mostly for refractories, abrasives, fused alumina feedstock, and welding) as these old and polluting kilns have been closed in favour of the perceived "cleaner" (but more expensive) rotary kiln production. Since these operations traditionally supplied some 60% of China's calcined bauxite production for domestic and overseas markets, this move has significantly reduced calcined bauxite supply from China.

Resource conservation

Put simply, under the stewardship of Hu Jintao, China's president elected in 2003, China has changed from a natural resources exporter to a natural resources protector. The stated policy of the Hu administration is to preserve natural resources for use at home in preference to export.
Indeed, this is probably no knee-jerk reaction since China's rulers are somewhat familiar with their country's natural resources – Hu trained as a water conservancy engineer, and Wan Jiabao, China's Premier, is a geologist and former director of the Ministry of Geology and Mineral Resources.

The upshot for the minerals industry is that certain mineral sectors are seeing a "protection" of resources, leading to limited availability for export and world market consumption, eg. for magnesite.

Cooling the economy

China has got tougher about cooling down its boom economy and addressing its trade surplus. The fall out for the industrial minerals business is that one of the key targets is China's export market. Measures designed to discourage mineral exports include those mentioned earlier, ie. recent export taxes, the abolition of export tax rebates, and the reduction of export licence quotas.

The three main driving forces influencing economic growth in China are investment, consumption, and net exports. All three forces are very powerful at present. China's net export surplus is huge, and has been recognised as a major problem. China's response, in which the export curb appears to be the most visible, is a strategic planning requirement of the 11th Five Year Plan. As an important part of the reform, China is striving to achieve a basic balance in foreign trade. In 2005, China's trade surplus totalled $101,900m. It is predicted that the gross volume will reach $150,000m. for 2006, a 50% increase. China very much wants to minimise any further such increases in trade surplus

Industry structure

As an approximate guide to China's industrial minerals mining sector, according the China Mining Industry Yearbook 2003, there were almost 149,506 mines (all types) operating in China in 2002, producing 4,904 m. tonnes. Of these, some 14,203 are non-metallic mineral mines (excluding construction and decorative stone operations – see table at end of paper).

Since China's opening up to the world market in 1978, it is widely regarded that most industrial minerals production, processing, and exporting today is largely conducted by the private sector. This trend appears set to continue and is in contrast to the giant state owned organisations that used to run the minerals sector until the late 1990s. On the whole the view is that mineral production, sales, and marketing is run on a more professional basis.

The three main challenges facing the industry were described by the CNMIA as "mainly policy based problems":

- declining resources;
- small scale of production; and
- lack of high tech processing.

Resources were claimed to be in decline, and this is compounded by many small producers operating with no real planning, and lacking in market competitiveness and good management.
One Chinese mineral said: "With good mines near to depletion, the quality is not as good as before, new mines cost a fortune to get the license – 20 years ago, it was almost free!"

The CNMIA is also very concerned over the small scale production of certain mines, particularly with regard to talc and graphite, and also the quality of their products. The demand for investment and innovation in high tech processing is also a major challenge. This is especially being felt in the filler minerals business, where loading levels in plastics for example are being increased. This is great for filler mineral demand, eg. for ground calcium carbonate (GCC), but such mineral grades require the appropriate degree of processing, eg. ultrafine grinding and surface treatment. This is lacking in many parts of China's filler minerals industry.

One of the underlying problems for China in trying to address these issues is the lack of a body at the state level to instruct clear policy and direction for the minerals industry. It is understood that the Ministry of Land and Resources takes a lead in this, but there is little or no collective response

or control over the industry. For example, the CNMIA would like to standardise the production of industrial minerals, but so far this has not yet materialised.

Certainly, efforts have been made by the government and the Ministry of Land and Resources in environmental restrictions, and in closing small mines, especially those that are unlicensed.
Also, in recent years, the government has slightly reduced the combined tax requirements for mineral producers. An often complex subject, especially for overseas mineral investors.

In response, the government has asked the CNMIA to regulate the structure of industrial minerals production in China.

The CNMIA intends to implement this through a range of measures, these include:

- raising the standard of production from raw mineral output to value added grades, by using high tech processing methods;
- the development of a higher scientific and technological level in operations;
- to enhance the merger of smaller producers into larger enterprises;
- encourage more foreign direct investment, especially advanced technology from overseas companies.

According to the CNMIA, some of these measures have already been acted upon in developing several specific mineral "production bases". These include two GCC operations, a 1m. tpa GCC operation near Lianzhou, Guangdong province, expected in production in 2007; and a 2.5m. tpa GCC operation near Chizhou, Anhui province, which was expected on stream in November 2006. The target markets for these operations are the highly lucrative plastics, paper, and rubber markets.

Other projects in the pipeline revealed by CNMIA include a feasibility study on a new graphite project in Heilongjiang province; a feldspar plant in Jiangxi province; and a 100,000 tpa wollastonite project at Lianzhou, Guangdong province.

Trading

In recent years, one of the key areas of debate has been the role of the "trader" and the trend by certain mineral consumers to directly source their mineral requirements from China (ie. without recourse to a trader or "middle man". But many traders, perhaps unsurprisingly, combat this view and promote the value in "port agents" as being more reliable for on time supplies and quality control, as well as investing in mines for long term supply and long term contracts.

Traders continue to grapple with China's export licence system, introduced in 1994 and undergoing continual modifications each year. China's recent membership of the World Trade Organisation was thought by some to mark the death knell of the export licence system, but the China Chamber of Commerce for Metals, Minerals, & Chemicals Importers & Exporters is of the opinion that it has some years to run yet.

Integration & diversification

Other trends include the increasing integration of activities by companies upstream and downstream. A company may secure its own raw material supply (own mines), operate a processing plant, and develop and operate plants manufacturing intermediate or end products. This is particularly prevalent in the refractories industry, with many bauxite, refractory clay, fused alumina, and magnesite miners now producing refractory bricks and monolithics.

Examples include China Mineral Processing Ltd, of Tianjin, which in addition to owning several raw material sources and a well established processing plant, is active in refractory pre-mixes, anti-skid road surfacing, developing a hydrofluoric acid facility, and most recently has begun construction of a foundry sands plant.

Similarly, Huang He Cast Plant, of Yima, Henan, focusing on fused minerals and markets, has its own mines, processing facilities, and is now manufacturing grinding wheels. The company has also purchased a local power plant to ensure energy supply – a critical requirement for any fused minerals producer in China.

Logistics

Logistics play a huge role in the trade of Chinese minerals, and it is important to appreciate influencing factors affecting both the internal freight network as well as the global freight market. Frankly speaking, the mineral industry has had a tough time of late.

The chief factors that have prompted huge increases in inland logistics costs have been the rising oil price; government imposed fines on truck overloading; and on the government controlled railway network, priority is given to strategic commodities such as coal, coke, and foodstuffs, thus reducing rail car availability for minerals. Port congestion is also a major problem, with vessel availability limited while stocks pile up awaiting shipment. Chinese internal freight is reported to have increased by about 40% while the shipping sector is on average at least 60% higher than four years ago.

Despite the strict control on loading levels, inland freight by truck is still considered by some as the most effective means of transports within China.

In response, mineral producers, and certainly any operations managed by western companies for exports, have to keep a keen eye out for the most effective and reliable logistical solutions – this means investing in staff and resources.

As a major consumer of bauxite for calcium aluminate cement production, Paris based Kerneos has invested in a strategic stock of bauxite held in China and France. Kerneos admits that this has been expensive, but it has allowed the company to mitigate supply shortages and some of the worst peaks of the sea freight market, which has been a very significant cost factor in recent years.

Energy

China's increasing demand for energy and its rising cost have been well documented. Since 2003, China has had a shortage of electricity, and at its nadir witnessed some 80% of provinces occasionally experiencing a black-out. From 2004-07, Chinese electricity costs have been estimated to have increased 5-10% annually, although other sources have suggested increases as high as 20%.

For example, power prices for south-east China were RMB0.36($0.04)/KWH in January 2006; up 8% to RMB0.39($0.05)/KWH from 1 May 2006; up a further 5% from 1 July 2006 to RMB0.25-0.415($0.03-0.05)/KWH.

Although China has a number of power plant projects coming on stream (including the Three Gorges hydro project) most players consider the problem very much current. Production of fused magnesia and fused alumina for example remains decided by power supply, ie. the start and finish of fusing is merely dictated by vagaries of the local electricity supply. It has been known that during the summer when air conditioning is in high demand, fused alumina plants have suffered shortages in power supply.

Consuming markets

Construction market boom

China's construction market is the prime driving force for much of the country's soaring demand for industrial minerals used in cement, construction materials, ceramics, glass, paint, plastics, and of course metal and steel production through casting sands, fluxes, and refractories.

According to a new study from The Freedonia Group Inc., construction expenditures in China are expected to increase 11.6% annually through 2010. In real terms, spending will grow at a 9.7% annual rate. An expanding domestic economy, sustained strength in foreign investment funding, healthy demand for Chinese manufactured goods, and further population and household growth will all work to drive demand for construction in China.

Nonbuilding construction (eg. rail, roads) will be the fastest growing sector, with expenditures climbing 10.5% annually. Growth will be driven by government funding for large-scale infrastructure construction like the Beijing-Shanghai High Speed Railway, the West-East Oil Pipeline, the South-North Water Diversion, the "7918 Network" national highway system, not to mention the 2008 Beijing Olympics.

Residential building construction activity will advance at a 9.1% annual pace in real terms through 2010, spurred by government efforts to boost average per capita living space and private home ownership. The privatisation of home ownership has been a dramatic trend in this sector – the percentage of homes that are privately owned has climbed from 72% in 1995 to 87% in 2005. By 2015, privately owned housing will account for over 95% of all units.

In 2005, the nonresidential building market accounted for over two-fifths of all construction spending in China, reflecting the nation's emergence as an economic powerhouse over the last decade and its position as the largest producer of manufactured goods in the world. Nonresidential construction expenditures are forecast to rise 9.4% annually (in real terms) through 2010, stimulated by increases in consumer spending, accommodative government policies, and foreign direct investment.

The Tanggu district of Tianjin, which hosts China's busiest trading port Xingang is a major hub of mineral processing companies and related mineral product manufacturing, eg. refractories, alumina cements. The entire area, some 2,270km^2, has been earmarked for a massive injection of investment and infrastructure development that will rival Shanghai's impressive Pudong district development by 2020.

In the last decade Tanggu has expanded significantly, and has extensively developed the Tianjin Economic Development Area (TEDA), host to alumina cement producer Kerneos China Ltd, and the Tianjin Marine Hi-tech Industrial Zone (TMHIZ), host to Allied Mineral Products (Tianjin) Ltd, China Mineral Processing Ltd, and Foseco, for example.

The ramifications of this upgrade and expansion to Tianjin are sure to impact the mineral industry of the region. For example, coal and coke shipments and handling have already been shifted to Nanjiang, the south port of Xingang.

New strict environmental regulations are being introduced for industries in TEDA and TMHIZ, which will no doubt challenge some of the existing operations there. It is already being considered that a number of small mineral processors will be forced to close as a result of either the new environmental regulations or development plans. The upshot is that the mineral processing industry of Tianjin as we know it may end up getting displaced in the near future.

Environment

Although perhaps considered still in its infancy, China's environmental protection industry is gearing up fast. Sure, China is building coal fired power stations every week and may soon overtake the USA as the world's leading source of CO_2 emissions.

Despite the impact of government legislation on mineral operations (emissions control, old kiln closures), market prospects can only be good for minerals used in environmental applications (such as limestone, dolomite, magnesium hydroxide, bentonite) as China aims to embark on a massive environmental clean up. There is no doubt that the looming Beijing Olympics in 2008 has helped focus the government's policies in this sector.

A recent parliamentary report revealed that acid rain caused by sulphur dioxide (SO_2) pollution from China's plants and power stations has affected a third of China's land mass and now poses a threat to food safety. Discharge of SO_2 in China rose by 27% to 25m. tonnes between 2000 and 2005, providing the country with the dubious title of the world's top SO_2 polluter.

In response, China has pledged to install desulphurisation facilities in coal-burning power plants and is planning pilot emissions trading schemes to help improve air quality. The former measure will require a substantial supply of limestone, which are used in flue gas desulphurisation (FGD) scrubbers, and will result in production of FGD gypsum.

Demand is also expected to grow significantly for water treatment products in China. Estimates for this market growth are placed at 14.1% yielding a $4,200m. market by 2010. The government has begun to adopt policies enunciated in the Eleventh Five Year Plan that promotes more efficient use of water, greater recycling rates, more aggressive treatment of wastewater, and better provision of municipal drinking water treatment and supply. These measures should increase demand for lime, magnesium hydroxide, and bentonite use in wastewater treatment, as well as silica sand, magnetite, and garnet use in water filtration systems.

Foundry

Growth in the Chinese metal castings industry has led to expectations that China will produce near to 30% of the world's total of castings by 2008. Gray iron shipments are forecast to increase from 11.27m. tonnes in 2004 to 12m. tonnes in 2006, and 12.75m. in 2008. Ductile iron production is forecast to rise from 5.5m. tonnes in 2004 to 6.7m. tonnes in 2008 as exports increase and pipe and construction castings are substituted for gray iron.

One of the main market drivers is the automotive industry, where use of aluminium is expected to see aluminium castings rise to 2m. tonnes in 2008. Demand for bentonite binders chromite, olivine, zircon, and silica casting sands, as well as ceramic shell components in investment casting such as mullite, andalusite, fused silica, and zircon, is set to rise.

Paint

The Chinese paint and coatings industry has evolved rapidly in recent years. This will be welcome news for filler and pigment mineral producers and investors such for talc, kaolin, TiO_2, barytes, wollastonite, mica, and calcium carbonate.

The period 2002-03 witnessed considerable manufacturing facility investment, followed in 2004-05 with investment in R&D and technical centres. By 2005-06, major multinational paintmakers had turned their attention to direct acquisition of Chinese paint producers, rather than mere plant investment or joint ventures. These included the likes of Akzo Nobel, PPG, and Valspar.

Growth for the Chinese architectural coatings market remains assured, with housing completions rising by 20% in 2005. Knowles points out that there will be a much greater demand for exterior

wall paints. Currently, these account for only about 16-17% of the Chinese architectural coatings market, but by 2015 they will be in the firm majority with about 60%.

The Chinese automotive coatings market is the world's second largest after Japan and is growing apace. Key drivers include the robust growth rates in the automobile industry (currently at 15%) and globalisation of the chemical industry leading to access to superior Western technologies. The automotive original equipment manufacturer coatings market in China is estimated to grow at 7-8% per annum in 2006.

Paper

China has experienced a massive expansion in pulp and papermaking. For the first time, a Chinese company, Shandong Chenming Paper Holdings, is among the world's 50 largest pulp and paper producers with $1,185m. in 2005 sales. Other leading producers edging into the leading world players market include Nine Dragons Paper, Lee and Man, and Shandong Huatai Paper.

Chinese paper production for 2005 was projected at 54m. tonnes, representing a huge increase from 30.9m. tonnes in 2000. The boom in paper demand in China is driving demand for paper grade kaolin, calcium carbonate and talc. Already, leading paper mineral suppliers such as Imerys and Omya have followed leading western papermakers (such as International Paper, Stora Enso, and UPM) into China and have set up facilities to supply new paper plants, mostly with GCC slurry.

However, there is understood to be a looming shortage in both talc and high brightness GCC production for paper in China, and raw material suppliers are busy seeking regional sources of these minerals.

Refractories

With its booming steel, glass, cement, and ceramics industries, China's demand for refractories is rising fast. As a result, key minerals such as bauxite, magnesite, refractory clays, calcined alumina, fused alumina, silicon carbide, graphite, and mullite are all in high demand.

According to the International Iron and Steel Institute, in 2006, China produced 418.8m. tonnes of crude steel, an increase of an incredible 313.8% in just ten years. China's share of world crude steel production has also increased exponentially. In 1996, China became the largest steel producing country in the world for the first time, accounting for just 13.5% of production. In 2006, this share had risen to 33.8%, just above one third of all crude steel produced in the world.

Ten years ago the Asia region accounted for 38.4% of all crude steel produced. By 2001, this percentage had risen to 41.6%. In 2006, the Asia region accounted for 53.7% of world crude steel production.

China is now also the world's leading producer of refractories. Output stands at about 23m. tonnes, which is approaching a level four times greater than the highest US production in 1979. According to an estimation by the China Refractory Industry Association (in 2005) the unit refractory consumption in China is about twice that of other regions. For example, specific refractory consumption per tonne of steel produced in Japan is <10kg/t steel, whereas in China it can vary between 20-40kg/t steel.

As China develops, not to mention other Asian developing countries, its per capita consumption of refractories will gradually increase towards an expected 20kg per capita in line with North America.

Corporate activity

Although the establishment of mineral operations in China by western companies remains a challenging process, advances have been made by the authorities to attract foreign investment, especially to help open up the western provinces of China – a particular priority at present. Also, it is now possible to establish wholly owned operations in China, rather than joint ventures.

Attracted by the expanding domestic markets, as well as those in neighbouring Asian countries, the flow of western mineral companies to China has risen from a trickle, but not quite yet to a steady flow. Overseas players established with raw materials operations in China include: Almatis (calcined alumina), American Colloid (bentonite), Astron (fused zirconia, TiO_2), Imerys (GCC), LWB (refractory dolomite), Omya (GCC), Quarzwerke (wollastonite), S and B Industrial Minerals (wollastonite, perlite), and Sibelco (silica sand).

Likewise, leading western manufacturers of mineral containing end products have also set up shop in China, especially in the refractories, paper, paint, plastics, glass, and ceramics sectors. The key thing here is that in response to China's modernisation and consumer demand, these companies are producing the same quality products that they are already producing in the west.

Therefore they require the same high standard of raw material input. This is an ideal opportunity for western mineral suppliers to "follow" their customers to China and attempt to maintain a supply-consumer relationship in the country by establishing a production base (eg. Imerys slurry GCC for UPM and Stora Enso paper plants in Jiangsu province).

Likewise, with more private companies and a slightly more affluent industry (owing to the soaring economy), Chinese mineral producers are investing and upgrading their plants to meet this challenge – this trend has not been lost on western mining and mineral processing equipment and technology suppliers to China, Hosokawa Alpine AG has enjoyed some success in selling fine grinding plant in China.

But China is also looking beyond its borders. Since 2004, with a weather eye on securing overseas raw material supply sources, China has made no secret of its acquisitive approaches to high profile western commodities companies (eg. Noranda). The South African chrome market has also been targeted, as have mineral resources in Africa in general.

For the industrial minerals industry, this trend was brought into sharp focus most recently with the acquisition of Guyana's refractory (and metallurgical) bauxite producer Omai Bauxite Mining Inc. (OBMI) from Iamgold, Canada and the government of Guyana, for $46m. by Bosai Minerals Co. Ltd. Bosai Minerals, based in Chongqing is one of China's leading calcined bauxite producers (also fused alumina, kaolin, and flint clay).

The crucial point here is that outside of China, OBMI is the world's only other commercially developed source of refractory grade bauxite (the renown RASC grade). Thus, it leaves the world refractory bauxite supply market firmly in the hands of the Chinese.

Conclusions & Outlook

The bottom line is that China is actively discouraging the export of minerals in an effort to redress its trade imbalance and protect its natural resources, while at the same time encouraging producers to supply higher standard mineral grades to domestic markets. The government is also encouraging Chinese companies to invest in other countries for resources with preferential policies and financial support.

With China's domestic market boom continuing, it is likely that industrial mineral exporters will increasingly switch to serving the domestic market. The country is looking to promote domestic demand, especially consumer demand, and at the same time reduce energy consumption by targeting exports of energy intensive commodities, such as minerals.

It does not make sense any more for China to export important raw materials in return for dollars. It is surely just a matter of time before the export licence and any other export tax measures are implemented for all minerals.

This should be good news for overseas mineral and intermediate product investors already active and established in China, and thus serving the domestic (and East Asian) growth markets. More overseas joint ventures and companies will become established in China to pursue domestic markets.

It is also good news for mineral producers outside China, certain of which are already enjoying some recapture of their market share previously lost to cheap Chinese exports in the 1990s.

For those in the business of sourcing minerals from China, perhaps the time has come to reorientate the business plan, and consider the merits of supplying minerals *to* China – some players have already embarked on this course. Otherwise, the only other alternative will be to simply look elsewhere for industrial mineral sources.

The outlook for China's mineral markets really depends upon where you stand in the industry. Generally speaking, supplying China's domestic market with minerals or intermediate mineral products appears set for continued growth. But if you are into sourcing minerals from China for export to global markets then the future will become more challenging.

Magnesite case study

It is beyond the scope of this paper to examine the trends and developments in all China's industrial minerals, but a brief look at the magnesite industry of Liaoning serves to highlight the effect of some of these influencing factors on this particular industry sector:

- Liaoning now has some 500 magnesia-based refractory companies, contributing to RMB16,000m. ($2,030m.) of sales income, and RMB2,500m. ($317m.) in profit and taxes. In 2005, the sales income of each of the top 24 magnesia-based product manufacturers exceeded RMB100m.($12.7m.).
- In line with the central government's mineral protection policy, Liaoning's magnesite sector has been the subject to a "Reduce" policy. From 1994-2005, the export of caustic calcined magnesia (CCM) and dead burned magnesia (DBM) reduced by 39.7%, but the export unit price i

ncreased by 202.7%, and export value increased by 83.1%.

- The provincial government has undertaken an accelerated structure adjustment and upgrade of magnesia products for export and domestic use; the elimination of small, inefficient, and environmentally unfriendly producers, while consolidating and strengthening larger producers; the attraction of foreign capital, advanced technology, and scientific management; a greater focus on R&D leading to better ratio of performance:price satisfying market demand; and raising the level of environmental protection and health and safety.
- Of note should be the drive for the increased upgrade of magnesia products. In 2005, China's export value of magnesia refractory bricks exceeded that of CCM and DBM exports for the first time, by attaining $300m.
- Early December 2006: four main magnesite producers of Liaoning province (Xiyang Group, Houying Group, Haicheng Huayu, and Jiachen Group) met, and, apparently supported by the Haicheng Municipal government, agreed on a US$10/tonne price rise for dead burned magnesia grades:

  all US$/tonne, FOB, Liaoning port:

DBM9003	$135-40
DBM9010	$145
DBM9540	$190
DBM9730	$240

  Incredibly, these follow earlier price increases announced in November 2006, eg. DBM9003 from $100 to $130/tonne, and DBM9730 from $200 to $230/tonne.
- The export licence for the first half of 2007 is expected to be reduced by some 10% for magnesia, while the volume quota for H1 is 700,000 tonnes. The full 2007 year quota for magnesite is understood to be 1.2m. tonnes. Some 400,000 tpa of magnesite is apparently shipped to Japan, Taiwan, and South Korea without export licence.
- Mid-December 2006: fears that new 10% export tax to be levied by government on magnesite and magnesia exports effective 1 January 2007.
- Exporters "grabbed material" in order to fill vessels leaving China around 30 December solely in order to avoid the export tax.
- January 2007: Haicheng government introduces measures to restrict magnesite ore movements in district to encourage better utilisation of resources. Reserves of "special grade" ore (>47% MgO) are depleting – impacting caustic calcined magnesia feedstock for fused magnesia grades (FM97/98).
- February 2007: a meeting took place between the leaders of the dominant magnesite companies in which they discussed *another* increase in price for dead burned magnesia
- speculation that new 10% export tax will be implemented after Chinese New Year, from 1 March 2007.

Chinese mineral production 2005 (m. tonnes)

Asbestos	0.40
Attapulgite & sepiolite	0.17
Barite	4.40
Bentonite	2.30
Boron minerals (B_2O_3 12%)	1.7
Diatomite	0.10
Feldspar	2.3
Fluorspar	2.70
Graphite amorphous	1.05
Graphite flake	0.40
Ground calcium carbonate	4.60
Gypsum	32.00
Kaolin	3.70
Magnesite & magnesia	15.44
Mica	0.15
Phosphate rock (P_2O_5 30%)	30.45
Potash (K_2O)	0.45
Pyrites (S 35%)	11.46
Strontium minerals ($SrSO_4$ 80%)	0.7
Talc powder	2.00
Talc lumps	0.60
Vermiculite	0.1
Wollastonite	0.35

Source: various sources compiled by Murray Lines, Stratum Resources, Australia

Chinese industrial minerals exports 2005

Mineral	Volume		Average price	
	tonnes	Increase %	US$/t	Increase %
Graphite	493,746	9.30	173.06	16.61
graphite flake	156,627	14.50	311.15	7.09
Silica sand	1,216,850	104.14	11.17	-23.02
Quartz, quartzite	71,351	25.44	62.90	22.14
quartz powder	28,031	119.88	81.36	11.47
Kaolin	1,188,488	11.69	45.66	21.72
refined kaolin	1,036,230	8.28	44.32	24.77
Bentonite	257,532	37.03	79.20	10.69
Activited bentonite	15,580	-16.09	115.40	-2.15
Sillimanite mienrals	7,852	432.76	99.99	-48.66
Barite	3,077,098	28.51	32.50	6.95
Diatomite	42,476	43.84	128.10	-15.35
Gypsum	294,960	9.44	32.14	15.99
Asbestos	5,381	59.40	238.28	26.42
Mica	89,260	-3.03	129.44	8.28
mica powder	79,155	2.05	138.78	9.25
Talc	559,194	-13.03	126.10	22.94
talc powder	237,468	-3.67	164.36	14.80
Feldspar	853,643	-8.07	13.66	20.99
Fluorspar	730,722	-12.40	176.24	23.37
Unexpanded vermiculite, perlite	211,687	16.12	78.50	3.22
Unexpanded chlorite	1,057,382	17.16	45.27	13.86
Calcium carbonate	74,281	-9.30	125.21	28.86

Source: China Customs General, 2006

Industrial mineral mines of China

Minerals	Total number	Large mine	Medium mine	Small mine	Small operation	Crude output ('000 tonnes)
Grand Total*	**149,506**	**498**	**1127**	**34,014**	**113,867**	**4,904,439**
Total**	**14,203**	**115**	**246**	**4020**	**9,659**	**289,050**
Bauxite	313	5	4	14	290	3,663
Lithium	8	1	1	6		235
Zircon	19	5	5	8	1	27,215
Celestite	26	2			24	246
Heavy RE	22			18	4	4,847
Light RE	105			29	76	3,271
Kyanite	3			2		28
Sillimanite	19	1		3	15	36
Andalusite	2			2		
Magnesite	174	3	2	118	51	4,896
Fluorspar	789		7	246	536	4,449
Limestone for flux	227	4	8	92	123	29,658
Dolomite for metallurgy	309	3	2	63	241	11,068
Quartzite for metallurgy	490		2	33	455	2,056
Sandstone for metallurgy	96			3	93	222
Sandstone for foundry	41			7	34	227
Sand for foundry	153		1	53	99	1,245
Vein quartz for metallurgy	243	1		16	226	564
Fire clay	595	5	2	89	499	2,206
Clay for foundry	6			1	5	20
Serpentine for flux	6		2	1	3	521
Pyrite	636	1	4	121	510	7,717
Alunite	16		3	1	12	121
Trona	88	6	14	27	41	7,418
Barytes	380	3	3	144	230	2,068
Natural soda	48	2	2	7	37	2,273
Ochre	1			1		3.0
Limestone for calcium carbide	59	1		5	53	1,850
Limestone for soda	189		2	10	177	2,768
Limestone for fertilizer	14			1	13	137
Dolomite for fertilizer	19			2	17	225
Quartzite for fertilizer	180				18	30
K-bearing rock	98			25	73	771
K-bearing sandstone & shale	22			22		315
Peridotite for fertilizer	1				1	0.1
Serpentinite for fertilizer	26		1	14	11	309

Rock salt	100	20	15	46	19	15,276
Lake salt	37	4	3	16	14	2,640
Natural brine	273	2	13	100	158	8,239
Potash	5	2		3		6,705
Bromine	14		1		13	33
Phosphorite	499	12	23	30	54	20,727
Boron mineral	89	1	4	103	361	1,101
Graphite	135	6	14	40	75	3,382
Quartz crystal for melting	1			1		20
Quartz crystal for craft	1			1		5,000
Wollastonite	182		3	28	151	676
Talc	264	3	4	91	166	246
Chrysotile asbestos	61	5	16	2	38	5,641
Blue asbestos	1			1		
Mica	39			39		3
Feldspar	423			45	378	1,320
Garnet	22			22		115
Pyrophyllite	139			69	70	1,638
Diopside	32			32		242
Vermiculite	18		1		17	127
Zeolites	184		1	8	175	1,278
Tremolite	9				9	3
Gypsum	732	7	61	259	405	19,629
Calcite	597			152	445	3,246
Optical fluorspar	2			2		1
Limestone for glass	5			1	4	112
Limestone for lime	2,173		1	217	1955	40,444
Chalk	11			1	10	140
Dolomite for glass	69			16	53	1,211
Quartzite for glass	406	2	6	117	281	6,259
Sandstone for glass	92		1	24	67	1,401
Sandstone for ceramics	40			1	39	346
Sand for glass	118	2	3	113		3,799
Vein quartz for glass	199			199		422
Tripoli	52				52	116
Diatomite	34		1	8	25	142
Kaolin	622	6	2	385	229	6,571
Clay for ceramics	697		1	461	235	6,068
Attapulgite clay	18			8	10	98
Sepiolite clay	15			2	13	22
Illite clay	25		1	4	20	43
Hectorite clay	1				1	0.3
Bentonite	344		6	189	149	1,890

Source: China Mining Industry Yearbook 2003

* grand total includes metallic mines, industrial minerals and rock mines for construction and decorative stone

** total of industrial minerals mines shown in table