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

Mike O’Driscoll,
Editor, Industrial Minerals

Future Trends in Industrial Minerals
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The only place to meet with key players in the Chinese and East Asian industrial minerals market
Outline

1. Evolution of mineral trade
2. Government influence
3. Industry structure
4. Logistics
5. Energy
6. Consuming markets
7. Corporate activity
8. Conclusions & Outlook
### 1. Evolution of mineral trade

**China as dominant mineral supplier**

#### Chinese industrial mineral production 2005 (m. tonnes)

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Production (m. tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos</td>
<td>0.40</td>
</tr>
<tr>
<td>Attapulgite &amp; sepiolite</td>
<td>0.17</td>
</tr>
<tr>
<td>Barite</td>
<td>4.40</td>
</tr>
<tr>
<td>Bentonite</td>
<td>2.30</td>
</tr>
<tr>
<td>Boron minerals (B$_2$O$_3$ 12%)</td>
<td>1.7</td>
</tr>
<tr>
<td>Diatomite</td>
<td>0.10</td>
</tr>
<tr>
<td>Feldspar</td>
<td>2.30</td>
</tr>
<tr>
<td>Fluorspar</td>
<td>2.70</td>
</tr>
<tr>
<td>Graphite amorphous</td>
<td>1.05</td>
</tr>
<tr>
<td>Graphite flake</td>
<td>0.40</td>
</tr>
<tr>
<td>Ground calcium carbonate</td>
<td>4.60</td>
</tr>
<tr>
<td>Gypsum</td>
<td>32.00</td>
</tr>
<tr>
<td>Kaolin</td>
<td>3.70</td>
</tr>
<tr>
<td>Magnesite &amp; magnesia</td>
<td>15.44</td>
</tr>
<tr>
<td>Mica</td>
<td>0.15</td>
</tr>
<tr>
<td>Phosphate rock (P$_2$O$_5$ 30%)</td>
<td>30.45</td>
</tr>
<tr>
<td>Potash (K$_2$O)</td>
<td>0.45</td>
</tr>
<tr>
<td>Pyrites (S 35%)</td>
<td>11.46</td>
</tr>
<tr>
<td>Strontium minerals (SrSO$_4$ 80%)</td>
<td>0.7</td>
</tr>
<tr>
<td>Talc powder</td>
<td>2.00</td>
</tr>
<tr>
<td>Talc lumps</td>
<td>0.60</td>
</tr>
<tr>
<td>Vermiculite</td>
<td>0.1</td>
</tr>
<tr>
<td>Wollastonite</td>
<td>0.35</td>
</tr>
</tbody>
</table>
1. Evolution of mineral trade
China as dominant mineral supplier

<table>
<thead>
<tr>
<th>Leading supplier:</th>
<th>US imports 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Net import reliance</td>
</tr>
<tr>
<td>Barite</td>
<td>83%</td>
</tr>
<tr>
<td>Bauxite</td>
<td>n.a.</td>
</tr>
<tr>
<td>Fused alumina</td>
<td>n.a.</td>
</tr>
<tr>
<td>Fluorspar</td>
<td>100%</td>
</tr>
<tr>
<td>Graphite</td>
<td>100%</td>
</tr>
<tr>
<td>Magnesite</td>
<td>53%</td>
</tr>
<tr>
<td>Refractory clays</td>
<td>n.a.</td>
</tr>
<tr>
<td>Silicon carbide</td>
<td>82%</td>
</tr>
<tr>
<td>Talc</td>
<td>11%</td>
</tr>
<tr>
<td>Wollastonite</td>
<td>n.a.</td>
</tr>
</tbody>
</table>
1. Evolution of mineral trade

China as dominant mineral supplier

The “China factor”
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1. Evolution of mineral trade

China as dominant mineral supplier

Source: Chinability
2007 growth forecast 10%
1. Evolution of mineral trade

China as dominant mineral supplier

1. Opened up in 1978

2. 1980s emergence as major exporter
   - low cost
   - inconsistent quality

3. Dominated by large SOEs

4. 1990s China/East Asian growth
   - manufacturing shift East
   - overseas j-v trickle
   - emergence of port processors & “brokers”
   - value added exports – semi-processed
1. Evolution of mineral trade
China as dominant mineral supplier

Bosai Minerals, Tianjin
1. Evolution of mineral trade

China as dominant mineral supplier

5. 1994: export licences introduced
6. 2000 Chinese economy booms, 8% growth
7. Export quality improves
   - squeezes Western producers
   - some exit market (magnesia, fused alumina)
8. 2003-04 economy soars, 10% growth
   - domestic industries expand
   - domestic market priority for minerals
   - rising costs & shortages in power supply
   - rising costs & shortages in internal freight
   - rising costs & shortages in ocean freight
2. Government influence
Key to Chinese minerals outlook

1. Export license system
   - 1994, CCCMC
   - more control, avoid dumping, add value
   - magnesite, fluorspar, talc, SiC, bauxite, brucite
   - flat fee, bidding and quota systems
   - illegal license trading, collusion, smuggling
   - annual modifications, confusion
   - price increases, export volume reductions

2. Resource tax
   - few-tens US$; a “provincial” tax

3. Antipollution legislation
   - closure of old bauxite kilns; supply squeeze
2. Government influence

Magnesite exports
2. Government influence

Bauxite kilns
2. Government influence

Key to Chinese minerals outlook

“Cooling” the economy

   - bauxite, SiC, BFA, RE, graphite, magnesite, fluorspar, talc, barite; from 13-17% to 0%
   - resulted in export price increases

   - 10% tax on RE, andalusite, kyanite, sillimanite, mullite, apatite, fluorspar, MIO, Ti-minerals, zircon; others to follow

6. Resource protection
   - “SD”; conserve raw materials for domestic market
2. Government influence
Key to Chinese minerals outlook

Chinese trader comments:

“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.”
2. Government influence
Key to Chinese minerals outlook

Chinese trader comments:

“The overseas buyer will either be forced to pay a significantly higher price for Chinese minerals or buy from an alternative source.”
3. Industry structure

A need to upgrade and make more efficient

- 14,203 non-metallic mineral mines
- 289m. tonnes
- Privatisation trend away from state-, province-, town-, village-owned enterprises
- “Policy based problems”:
  - declining resources
  - small scale producers – eg. talc, graphite
  - lack of high tech processing – eg. GCC
  - lack of state level organisation
3. Industry structure
A need to upgrade and make more efficient

• CNMIA response:
  - raise production standards, add value
  - develop high tech processing
  - enhance merger of smaller producers
  - attract more foreign investment
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3. Industry structure

Mining
3. Industry structure

Mining
3. Industry structure

Opening up new regions for development - Xinjiang

Xinjiang Bazhou Yilong Andalusite Mineral Co., Ku’erle, Yanji, Xinjiang

Xinjiang Yuli Xinlong Vermiculite Co. Ltd, Xinjiang
3. Industry structure

Opening up new regions for development

Inner Mongolia
Opening up new regions for development – Inner Mongolia

Meng Sheng Minerals, Jungar, Inner Mongolia
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Integration and diversification
minerals + intermediate +/or end products

3. Industry structure
A need to upgrade and make more efficient

China Mineral Processing, Tianjin
4. Logistics
A constant challenge in terms of cost & availability

• Chief issues:
  - rising price of fuel
  - govt. clampdown on truck overloading
  - railcar priority to coal, coke, grain
  - increased cost of ocean freight
  - shortage of vessels
  - port congestion, stocks awaiting export

• Response:
  - more effort in determining logistical solutions
  - invest in strategic stockpiling
  - secure alternative supply sources
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4. Logistics

A constant challenge in terms of cost & availability
A constant challenge in terms of cost & availability
4. Logistics

Solutions

1. Loading bulk and trimming flat with grab
2. Trimming flat with caterpillar
3. Laying tarpaulin and gluing up to 25-50cm on side-walls of the hold
4. Loading Big Bags inside the hold
5. First layer of Big Bags inside the hold
6. Using thick rubber mats or steel plates underneath hydraulic excavator in order to protect tarpaulin

Courtesy Yasheya Ltd
5. Energy

The Achilles heel of energy intensive mineral operations

Total Primary Energy Supply - Reference Scenario
China

Source: IEA Energy Statistics and World Energy Outlook forecasts - Copyright © OECD/IEA 2006
Access to historical detailed data for almost all fuels for both OECD countries and over 100 other countries is available through the IEA website at: http://www.iea.org/statistics
5. Energy
The Achilles heel of energy intensive mineral operations

• Chief issues:
  - power shortages since 2003
  - worst case, 80% provinces had black outs
  - 2004-07, power costs rising 5-10% p.a.
  - fused mineral producers hit hardest
The Achilles heel of energy intensive mineral operations

eg. Magnesia shaft kilns
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5. Energy

The Achilles heel of energy intensive mineral operations

eg. fused magnesia electric arc furnace
6. Consuming markets
Economic growth feeds domestic industry boom

• Construction
  - prime driving force for minerals markets:
    cement, ceramics, glass, paint, plastics, metals,
    steel (fluxes, refractories, castings)
  - building expenditure 9.7% p.a. growth to 2010
  - expressways, rail links, port infrastructure
  - increased private housing
  - Beijing 2008 Olympics
Economic growth feeds domestic industry boom
6. Consuming markets
Economic growth feeds domestic industry boom

• Environment
  - Govt. policy in infancy, but steadily growing
  negative:
    - emissions controls, eg. bauxite kiln closures
  positive:
    - waste/water treatment, 14.1% p.a. 2010, $4,200m.
    - limestone, lime, Mg(OH)$_2$, bentonite, silica sand, garnet, magnetite
    - SO$_2$ discharge 27% rise 2001-05, at 25m. tonnes
    - FGD installation programme
    limestone, lime, Mg(OH)$_2$
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6. Consuming markets

Economic growth feeds domestic industry boom
6. Consuming markets
Economic growth feeds domestic industry boom

• Foundry
  - 30% or world metal castings by 2008
  - automotive castings expansion (15%)
  chromite, olivine, zircon, silica sand, mullite, andalusite, fused silica, zircon
6. Consuming markets
Economic growth feeds domestic industry boom

- **Paint**
  - multinational paintmakers in China: Akzo Nobel, PPG, Valspar
  - key drivers: architectural coatings (20% rise in 2005) & automotive coatings
    - barite, calcium carbonate, iron oxide, kaolin, mica, talc, TiO$_2$, wollastonite
6. Consuming markets
Economic growth feeds domestic industry boom

- **Paper**
  production from 30.9m. in 2000 to 55m. tonnes 2005

  calcium carbonate (GCC, PCC), kaolin, talc, TiO₂

![China Paper Production and Projected Growth Until 2015](chart)

Source: Song Bao Xiang, 2003
6. Consuming markets

Paper market

- major players in China: UPM, Stora Enso, IP

- mineral producers “followed” papermakers,
  eg. Imerys, Omya

- potential shortage of high brightness marble,
  paper grade kaolin and talc

Courtesy Ian Wilson
6. Consuming markets

Paper market

Major paper mills in Zhejiang and Jiangsu provinces

 Courtesy Ian Wilson
Imerys GCC supply at Changshu and Suzhou
6. Consuming markets
Economic growth feeds domestic industry boom

- **Refractories**
  - driven by steel, nonferrous metals, cement, glass, lime, ceramics
  - bauxite, magnesite, refractory clays, mullite, alumina, fused alumina, SiC, graphite, andalusite

- 2006 crude steel production 418.8m. tonnes;
- a 313.8% increase from 1996
- now 1/3 world steel production
- 23m. tpa refractories
- 20-40 kg/t steel specific refractory consumption
6. Consuming markets
Refractories market

- major players established in China: eg. RHI, Vesuvius, Orissa, Morgan Crucible, Allied Mineral Products, Clayburn, Ropcycze, Krosaki
- close to market, close to raw materials, eg. j-v Liaoning RHI Jinding Magnesia Co. Ltd
- plant capacities expanding, eg. RHI, Kerneos, Almatis

- recent upgrade in Chinese Co. refractory plants
- products exported as “second wave”
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6. Consuming markets

Refractories market

Refractories j-v, X-R Ropczyce, Haicheng, Liaoning
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6. Consuming markets

Refractories market

Houying Refractories Group expansion, Haicheng, Liaoning
7. Corporate activity
Increasing at home and abroad

• In China
  - increasing foreign investment in minerals
  - mineral producers
    eg. Almatis (calcined alumina)
    American Colloid, Sud Chemie (bentonite)
    Astron (fused zirconia, TiO$_2$)
    Imerys (GCC)
    LWB (refractory dolomite)
    Omya (GCC)
    Quarzwerke (wollastonite)
    S and B (wollastonite, perlite)
    Sibelco (silica)
  - mineral consumers
  - mineral processing suppliers, eg. Hosokawa
7. Corporate activity

Increasing at home and abroad

- Outside China
  - govt. support for Chinese Co.s to invest overseas
  - Noranda bid, African interests
  - acquisition of Omai Bauxite Mining Inc., Guyana by Bosai Minerals Group, Chongqing, for $46m., Jan. 2007
  - OBMI world’s only source of refractory grade bauxite outside China…now under Chinese ownership
  - delicate situation for Resco Products Inc.’s lawsuit vs. Chinese bauxite exporters
7. Corporate activity

Bosai Minerals in Guyana
8. Conclusions & Outlook

Opportunities to be taken

- Bottom line: China is actively discouraging exports
- Aim to conserve domestic raw materials for domestic market demand priority, reduce energy consumption, and reduce trade imbalance
- Mineral exporters to increasingly supply domestic market
- Good news for overseas mineral investors in China, more will join them
- Good news for overseas mineral producers to fill gap from reduced Chinese exports – already being realised
- Sourcing minerals from China: more challenging!
- Time to consider sourcing minerals to supply China
Golden opportunities

Year of the Golden Pig
Once every 600 years: wealth & virility