Refractory Raw Materials
Trends & developments in supply & demand

Mike O’Driscoll
Editor, Industrial Minerals
Selection of six refractory minerals

1. Commercial importance to world refractories market

2. Significant to China’s IM export value

3. China is world’s no.1 producer of these minerals
Focus on six refractory minerals:

1. Bauxite
2. Brown fused alumina
3. Graphite
4. Dead burned magnesia
5. Refractory clays
6. Silicon carbide
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Focus on six refractory minerals:

1. Principal sources of world supply
2. China’s main sources of supply
3. Trends & developments influencing supply
4. Conclude with outlook for demand
Bauxite: world sources

1. China
2. Guyana
3. Brazil
Bauxite: China sources

1. Estimates 0.7-3m. tpa; export 1-1.2m. tpa
2. Shanxi
3. Guizhou
4. Kiln types: rotary (70%), shaft, round
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Bauxite: trends - “Chinese still in demand”

1. China gained 70% market share
2. Enter Brazil early 1990s
3. Guyana on 3rd plan to upgrade/privatise
4. Mid-90s - foreign Co./j-v processors
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Bauxite: trends - “Supply tightens?”

5. 2000/01 Chinese supply shortages
   - environmental
   - freight

6. Rotary vs. pressurised shaft kilns?

7. Guizhou demand decline - for specific end users

8. 2001 licence fee: RMB230(US$28)/t no fixed quota

9. Bauxite brick demand down, monolithics promising
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**BFA: world sources**

1. 40-45% of 1m. tpa for refractories
2. China, N. America, Germany
3. Brazil, Venezuela, Hungary, France, India
China’s Refractories Seminar 2001- Technology & Markets, 25-27 April, Beijing

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**BFA: China sources**

1. 450-500,000 tpa
2. 60 producers; Guizhou, Henan, Shanxi
3. 300,000 tpa exports
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BFA: trends - “tighter, more competitive”

1. Consolidation in West
   - Imerys (Treibacher, C-E Minerals)
   - WMC/Exolon-ESK

2. Exits: UCM, Showa Denko
BFA: trends - “Chinese in demand”

3. Demand for Chinese BFA up, esp. USA
4. EU anti-dumping duty €204($182.6)/t
5. Chinese BFA enters EU via “3rd” countries
6. Maintaining demand - Japan consumption up
Graphite: world sources

1. 480,000 tpa

2. 80% - China, India, Brazil, Mexico, Czech Rep.
Graphite: China sources

1. 220,000 tpa; exports 80,000 tpa
2. Heilonjiang, Henan, Shandong
3. Liumao Graphite Mine, 36,000 tpa
Graphite: trends - “overcapacity”

1. Exits: Africa, Australia, China
2. Foreign interest in China
3. Lac Knife, Canada; Mazarin - 2004 50,000 tpa
4. ZGC upgrading in Ukraine
Graphite: trends - “demand consistent”

5. Minsource Liumao Graphite jv
   - 2001 expansion 60,000 tpa

6. Demand consistent in MgO-C bricks, EAF electrodes
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DBM: world sources

1. 60 producers of natural & synthetic DBM
2. 7.2m. tpa prod. cap.
   - 3m. “west”
   - 2.4m. Russia, captive
   - 1.8-2m. China
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**DBM: China sources**

1. 500 mines, 12m. tpa crude magnesite
2. Liaoning, Shandong
3. 20 key producers of 60-550,000 tpa cap.
4. Exports 1.6m. tpa
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DBM: trends - “consolidation & exits”

1. Consolidation: RHI (H-W); Grecian Magnesite (Magna)
2. Exits: National Magnesia, Asahi Glass, Birla Periclase, Seamag
3. Reductions: Ube, Premier Periclase, Britmag
4. Sardamag new shaft kiln 2001
5. DBM exports from N. Korea - 1996 failed, 2001?
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DBM: trends - “China exports under new Union”

7. EU anti-dumping renewed Feb. 2000 - €120($107)/t
8. 2 export syndicates formed 2000, $10-15/t rise
9. 35,000t illegal export Sept. 2000
10. 1st bidding: 1.6m. tonnes @ RMB350($42)/t
11. Feb. 2001 new single “union” to replace 2 groups
12. Steel upturn in 2000; but long term not as rosy
Ref. clays: world sources

1. >38% Al$_2$O$_3$; 42-47% Al$_2$O$_3$, calcined

2. 7.3m. tpa
   - China 4.5m.
   - USA 2m. tpa
   - France 0.5m.
   - Germany 0.3m.
Ref. clays: China sources

1. “flint clay” >45% Al₂O₃
2. 4.5m. tpa crude; 3m. tpa calcined
3. Shandong, Shanxi, Henan, Guizhou, Liaoning
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Ref. clays: trends - “few major suppliers”

1. C-E Minerals’ Mulcoa accepted as standard

2. US consolidation: H-W/A.P. Green to RHI

3. France: SOKA gain 47.5% AGS from Imerys
Ref. clays: trends - “few major suppliers”

4. EC anti-dumping duty of ‘96 expired 19.1.01

5. China plans upgrading ref. clay output


7. Demand consistent, up in USA, Japan
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SiC: world sources

1. 1.1m. tpa cap.; 750-850,000 tpa
2. China 40% production
3. N. America, Japan, Netherlands, Norway, Mexico, Venezuela
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SiC: China sources

1. 500,000 tpa all grades, 126 fusion plants
2. 70-80% metallurgical grade
3. Green SiC in Guizhou, Shandong
SiC: trends - “consolidation”

1. Consolidation: Saint-Gobain (Norton, Casil); WMC/Exolon-ESK

2. ESK-SiC still for sale (60,000 tpa Delfzijl)

3. Late 90s foreign interest in China - Norton, Treibacher, Nissho-Iwai & other Japanese
**SiC: trends - “consolidation”**

4. Rising power costs in China impacted supply

5. EU anti-dumping duty renewed in 2000, 52.6%

6. Demand buoyant, Japanese consumption up
Summary & conclusions

1. Six important refractory raw materials
2. China remains world no.1 producer
3. Significant % of China’s IM export revenue
4. China needs to maintain role of no.1 supplier
   - monitor global competition
   - upgrade production tech.
   - manage export prices/volumes
Summary & conclusions

5. Main factor: refractory market demand
   - specific consumption down overall
   - steelmaking tech. changes
   - bricks to monolithics trend continues
   - refractory producer consolidation
     • RHI (VRD/H-W/APG)
     • Cookson (Vesuvius/KSR/Premier/VGT-Dyko)
     • Lhoist-Wulfrath/Baker; Harima/Krosaki; Minteq/MM
Summary & conclusions

- LRM and RHI Malaysia plants for sale
- Vesuvius shifts bricks from UK to Poland
- Chinese ref. exports likely to rise

Steel outlook
  • US steel problems - LTV
  • European consolidation - Corus, Usinor et al
  • 2001 growth 2.3%, downturn mid-2001
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Summary & conclusions

- Steel producers seeking cheaper alternatives and blend materials
- Reduced demand overall, but demand nevertheless