

KYANITE AND RELATED MINERALS

(Data in thousand metric tons unless otherwise noted)

Domestic Production and Use: One firm in Virginia with integrated mining and processing operations produced kyanite from hard-rock open pit mines. Another company produced synthetic mullite in Georgia. Of the kyanite-mullite output, 90% was estimated to have been used in refractories and 10% in other uses. Of the refractory usage, an estimated 60% to 65% was used in ironmaking and steelmaking and the remainder in the manufacture of chemicals, glass, nonferrous metals, and other materials.

| Salient Statistics—United States: | 2002 | 2003 | 2004 | 2005 | 2006^e |
|--|-------------|-------------|-------------|-------------|-------------------------|
| Production: | | | | | |
| Mine ^e | 90 | 90 | 90 | 90 | 90 |
| Synthetic mullite ^e | 40 | 40 | 40 | 40 | 40 |
| Imports for consumption (andalusite) | 5 | 4 | 4 | 6 | 5 |
| Exports ^e | 35 | 35 | 35 | 35 | 35 |
| Shipments from Government stockpile excesses | — | — | 0.1 | — | — |
| Consumption, apparent ^e | 100 | 99 | 99 | 101 | 100 |
| Price, average, dollars per metric ton: | | | | | |
| U.S. kyanite, raw ¹ | 165 | NA | NA | NA | NA |
| U.S. kyanite, calcined ¹ | 279 | 279 | 272 | 272 | 313 |
| Andalusite, Transvaal, South Africa | 191 | 220 | 238 | 238 | 248 |
| Stocks, producer | NA | NA | NA | NA | NA |
| Employment, kyanite mine, office, and plant, number ^e | 140 | 125 | 120 | 130 | 135 |
| Net import reliance ² as a percentage of apparent consumption | E | E | E | E | E |

Recycling: Insignificant.

Import Sources (2002-05): South Africa, 100%.

| Tariff: Item | Number | Normal Trade Relations 12-31-06 |
|--------------------------------------|---------------|--|
| Andalusite, kyanite, and sillimanite | 2508.50.0000 | Free. |
| Mullite | 2508.60.0000 | Free. |

Depletion Allowance: 22% (Domestic), 14% (Foreign).

Government Stockpile: None

KYANITE AND RELATED MINERALS

Events, Trends, and Issues: The steel industry worldwide continued to be the leading consumer of refractories. According to the International Iron and Steel Institute, world crude steel production for the first 8 months of 2006 was about 9% higher than in the comparable period of 2005. The three leading producing countries were China with about 34%; Japan, 9%; and the United States, 8%.

China is also the leading producer of refractories. Output is about 23 million tons, which is approaching a level four times greater than the highest U.S. production (in 1979).³

The use of monolithic (unshaped) refractories, such as castables, gunning mixes, and plastics, continues to increase compared with bricks and shapes. In Japan and the United States, monolithics make up about 65% and 53% of total production, respectively. In China, monolithic production is probably less than 30% but is continuously increasing.⁴

World Mine Production, Reserves, and Reserve Base:

| | Mine production | | Reserves and reserve base ⁵ |
|----------------------------|-----------------|-------------------|--|
| | 2005 | 2006 ^e | |
| United States ^e | 90 | 90 | Large in the United States. South Africa reports reserve base of about 51 million tons of aluminosilicates ore (andalusite and sillimanite). |
| France | 65 | 65 | |
| India | 22 | 23 | |
| South Africa | 235 | 235 | |
| Other countries | 8 | 8 | |
| World total (rounded) | 420 | 420 | |

World Resources: Large resources of kyanite and related minerals are known to exist in the United States. The chief resources are in deposits of micaceous schist and gneiss, mostly in the Appalachian Mountains area and in Idaho. Other resources are in aluminous gneiss in southern California. These resources are not economical to mine at present. The characteristics of kyanite resources in the rest of the world are thought to be similar to those in the United States.

Substitutes: Two types of synthetic mullite (fused and sintered), superduty fire clays, and high-alumina materials are substitutes for kyanite in refractories. Principal raw materials for synthetic mullite are bauxite, kaolin and other clays, and silica sand.

^eEstimated. E Net exporter. NA Not available. — Zero.

¹Prices from trade journals.

²Defined as imports – exports + adjustments for Government and industry stock changes.

³Semler, C.E., 2006, Refractories review, destination, St. Louis: Ceramic Industry, v. 156, no. 8, p. 11.

⁴Semler, C.E., 2006, Refractories review, industry snapshot: Ceramic Industry, v. 156, no. 1, p. 10.

⁵[See Appendix C for definitions.](#)