

KYANITE

By Michael J. Potter

The refractories industry continued to be a major end use for kyanite, mullite, and synthetic mullite. For the refractories industry in general, there continued to be over capacity. Iron and steelmaking, the largest end use of refractories in general, increased at least 4%. Of two large U.S. end markets for raw steel, auto production was down, but nonresidential construction increased by over 12%. Japanese and Mexican refractory companies suffered from their country's economic conditions. However, preliminary information indicated that some companies in countries such as Belgium, France, and the United States posted good sales in 1995.¹

Production

Kyanite was mined at two open pit locations by Kyanite Mining Corp. in Buckingham County, VA. The company also operated beneficiation plants and calcining facilities for conversion of kyanite to mullite. High-temperature sintered mullite was produced by C-E Minerals in Americus, GA, and North American Refractories Co. at Greenup, KY. Data were obtained for the kyanite and both synthetic mullite producers but cannot be published because of company proprietary data.

Consumption

The U.S. Geological Survey does not collect data on end uses of kyanite and synthetic mullite. However, refractories were presumed to be a major end use, including monolithics such as ramming mixes, castables, gunning mixes, and plastics. Other end uses were whitewares, kiln furniture, acoustical tiles, catalytics, high tension insulators, shell castings, foundry uses, investment casting procedures, etc.

Foreign Trade

Shipments of U.S. kyanite, mullite, and synthetic mullite presumably were made to Europe, Latin America, and the

Pacific rim. Imports of andalusite in recent years have been largely from South Africa.

World Review

Capacity.—Rated capacity is defined as the maximum quantity of product that can be produced in a period of time on a normally sustainable long-term operating rate, based on the physical equipment of the plant, and given acceptable routine operating procedures involving labor, energy, materials, and maintenance. Capacity includes both operating plants and plants temporarily closed that, in the judgment of the author, can be brought into production within a short period of time with minimum capital expenditure.

Because actual capacity data were generally not available, the data in table 3 are estimated capacity for marketable product as of December 31, 1995. For most countries, capacity was considered to be the same as the highest production during the past 5 years.

Outlook

World refractories production has declined on a tonnage basis as demand has increased for improved, longer-lasting materials. The continuing interest in refractories technology is fueled by the increasing demand for refractory materials that meet the requirements of new high-temperature manufacturing processes in cement, glass, iron and steel, and other refractories-consuming industries. The ever increasing demand for high purity steel will require refractories linings that do not contaminate the melts.²

¹Ceramic Industry. Giants in Refractories. V. 145, No. 3, Aug. 1995, p. 47.

²Marvin, C. G. Refractories. Ceramics Industry, v. 145, No. 5, Oct. 1995, p. 20.

TABLE 1
PRICE OF KYANITE AND RELATED MATERIALS

(Dollars per metric ton)

	Price
Andalusite, Transvaal, 57.5% Al ₂ O ₃ , 2,000 metric ton bulk, f.o.b.	180 - 200
Andalusite, Transvaal, 59.5% Al ₂ O ₃ , 2,000 metric ton bulk, f.o.b.	200 - 220
U.S. kyanite, 54% to 60% Al ₂ O ₃ , 35-325 mesh, 18 ton lots, f.o.b. plant:	
Raw	128 - 161
Calcined	231 - 265
Sillimanite, South African, 70% Al ₂ O ₃ , bags, c.i.f. main European port	304

Source: Industrial Minerals (London), Dec. 1995, No. 339, p. 65.

TABLE 2
U.S IMPORTS 1/ FOR CONSUMPTION OF ANDULUSITE 2/ 3/

(Thousand metric tons and thousand dollars)

Year	Quantity	Value 4/
1994	7,900 e/	1,290 e/
1995	3,210	623

e/ Estimated.

1/ Most material is from South Africa.

2/ Harmonized tariff schedule (HTS) number: 2508.50.0000.

3/ Data are rounded to three significant digits.

4/ Customs value.

Source: Bureau of the Census.

TABLE 3
WORLD KYANITE AND RELATED MINERALS CAPACITY
DECEMBER 31, 1995 1/

(Thousand metric tons)

World region/mineral	Capacity 2/
North America:	
United States:	
Kyanite	W
Synthetic mullite	W
Total	W
South America:	
Brazil: Kyanite	1 e/
Europe:	
France: Andalusite	50 e/
Germany: Synthetic mullite	15 e/
Spain: Andalusite	5 e/
United Kingdom: Synthetic mullite	10 e/
Other countries	120 e/
Total	200 e/
Africa:	
Kenya: Kyanite	(3/) e/
South Africa:	
Andalusite	300 e/
Sillimanite	1 e/
Zimbabwe: Kyanite	2 e/
Total	303 e/
Asia:	
China: Unspecified	3 e/
India:	
Kyanite	12 e/
Sillimanite	15 e/
Total	27 e/
Japan: Synthetic mullite	40 e/
Total	70 e/
Oceania:	
Australia:	
Kyanite	1 e/
Sillimanite	(3/) e/
Total	1 e/
World total 4/	575 e/

e/ Estimated. W Withheld to avoid disclosing company proprietary data.

1/ Data are rounded to three significant digits.

2/ Because data are lacking for many countries, capacity is considered to be equal to the highest production during the past 5 years. (See Table 4.)

3/ Less than 1/2 unit.

4/ Excludes U.S. kyanite and synthetic mullite.

TABLE 4
KYANITE: WORLD PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons)

Country 3/ and commodity	1991	1992	1993	1994	1995 e/
Australia:					
Kyanite e/	800	800	800	800	800
Sillimanite e/ 4/	100	100	100	100	100
Brazil: Kyanite e/	600	600	600	600	600
China: Unspecified e/	2,500	2,500	2,500	2,500	2,500
France: Andalusite e/	50,000	50,000	50,000	50,000	50,000
India:					
Kyanite	30,000	10,100	11,400	12,000 e/	12,000
Sillimanite	11,600	18,800	14,900	15,000 e/	15,000
Kenya: Kyanite e/	(5/)	(5/)	(5/)	(5/)	(5/)
Korea, South: Andalusite	14	38	30 e/	30 e/	20
South Africa:					
Andalusite	210,000	230,000	188,000	190,000 e/	190,000
Sillimanite	422	632	569	500 e/	500
Spain: Andalusite e/	3,600	3,600	3,000	3,500	3,500
United States:					
Kyanite	W	W	W	W	W
Mullite, synthetic	W	W	W	W	W
Zimbabwe: Kyanite	2,460	1,990	878 r/	567 r/	600

e/ Estimated. r/ Revised. W Withheld to avoid disclosing company proprietary data.

1/ Data are rounded to three significant digits.

2/ Owing to incomplete reporting, this table has not been totaled. Table includes data available through Apr. 19, 1996.

3/ In addition to the countries listed, a number of other nations produce kyanite and related materials, but output is not reported quantitatively, and no reliable basis is available for estimation of output levels.

4/ In addition, about 7,000 metric tons of sillimanite clay (also called kaolinized sillimanite) is produced annually containing 40% to 48% Al₂O₃.