

## 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.

<b>Salient Statistics—United States:</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003<sup>e</sup></b>
Production:					
Mine <sup>e</sup>	90	90	90	90	90
Synthetic mullite <sup>e</sup>	39	40	40	40	40
Imports for consumption (andalusite)	6	6	3	5	7
Exports <sup>e</sup>	35	35	35	35	35
Shipments from Government stockpile excesses	—	—	—	—	—
Consumption, apparent <sup>e</sup>	100	101	100	100	102
Price, average, dollars per metric ton:					
U.S. kyanite, raw	158	165	165	165	165
U.S. kyanite, calcined	268	279	279	279	279
Andalusite, Transvaal, South Africa, 57% <sup>1</sup> Al <sub>2</sub> O <sub>3</sub>	200	161	162	176	203
Andalusite, Transvaal, South Africa, 58% <sup>2</sup> Al <sub>2</sub> O <sub>3</sub>	225	189	210	206	237
Stocks, producer	NA	NA	NA	NA	NA
Employment, kyanite mine and plant, number <sup>e</sup>	150	150	150	150	150
Net import reliance <sup>3</sup> as a percentage of apparent consumption	E	E	E	E	E

**Recycling:** Insignificant.

**Import Sources (1999-2002):** South Africa, 100%.

<b>Tariff:</b>	<b>Item</b>	<b>Number</b>	<b>Normal Trade Relations 12/31/03</b>
	Andalusite, kyanite, and sillimanite	2508.50.0000	Free.
	Mullite	2508.60.0000	Free.

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

**Government Stockpile:**

<b>Material</b>	<b>Stockpile Status—9-30-03<sup>4</sup></b>				
	<b>Uncommitted inventory</b>	<b>Committed inventory</b>	<b>Authorized for disposal</b>	<b>Disposal plan FY 2003</b>	<b>Disposals FY 2003</b>
Kyanite, lump	—	0.1	—	0.1	—

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**Events, Trends, and Issues:** Andalusite Resources (Pty) Ltd. began production at its Maroeleosfontein operation in Limpopo Province in South Africa. The company represents the only independent source of andalusite outside the Imerys group, which has andalusite operations at Glomel, France, and Annesley, South Africa.<sup>5</sup>

The global refractories industry is the largest market for kyanite and mullite. Vesuvius Group S.A., a major refractories company with its head office in Brussels, Belgium, had some plant closures and consolidations. However, the steel industry, which is the largest market for refractories, has shown signs of improved stability in Europe and the United States in 2003. Vesuvius reported significant business activity in the Asia-Pacific region, especially China. Growth in the Chinese market is highly competitive, with hundreds of indigenous refractory producers, some of which have very modern operations. The companies comprise a mixture of state and private ownership.<sup>6</sup>

### **World Mine Production, Reserves, and Reserve Base:**

	Mine production		Reserves and reserve base <sup>7</sup>
	2002	2003 <sup>e</sup>	
United States	<sup>e</sup> 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	20	20	
South Africa	195	220	
Zimbabwe	10	5	
Other countries	8	5	
World total (rounded)	390	410	

**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.

<sup>e</sup>Estimated. E Net exporter. NA Not available. — Zero.

<sup>1</sup>For 1999, 57.5% Al<sub>2</sub>O<sub>3</sub>.

<sup>2</sup>For 1999, 59.5% Al<sub>2</sub>O<sub>3</sub>.

<sup>3</sup>Defined as imports – exports + adjustments for Government and industry stock changes.

<sup>4</sup>See Appendix B for definitions.

<sup>5</sup>Industrial Minerals, 2003, Andalusite Resources on stream: Industrial Minerals, no. 427, April, p. 17.

<sup>6</sup>Moore, Paul, 2003, Let it flow: Industrial Minerals, no. 429, June, p. 14-15.

<sup>7</sup>See Appendix C for definitions.