

TITANIUM MINERAL CONCENTRATES¹

(Data in thousand metric tons of TiO₂ content, unless otherwise noted)

Domestic Production and Use: Two firms produced ilmenite and rutile concentrates from heavy-mineral sands operations in Florida and Virginia. The value of titanium mineral concentrates consumed in the United States in 2000 was about \$530 million. The major coproduct of mining from ilmenite and rutile deposits was zircon. About 95% of titanium mineral concentrates was consumed by TiO₂ pigment producers. The remainder was used in welding rod coatings and for manufacturing metal, carbides, and chemicals.

Salient Statistics—United States:	1996	1997	1998	1999	2000^e
Production ² (ilmenite and rutile, rounded)	200	400	400	300	300
Imports for consumption:					
Ilmenite and slag	641	651	732	776	617
Rutile, natural and synthetic	305	311	365	324	440
Exports, ^e all forms	10	15	38	6	9
Estimated consumption:					
Ilmenite and slag	1,010	1,060	³ 980	³ 963	³ 1,000
Rutile, natural and synthetic	365	383	392	413	430
Price, dollars per metric ton:					
Ilmenite, bulk, 54% TiO ₂ , f.o.b. Australian ports	87	83	77	98	95
Rutile, yearend, bulk, f.o.b. Australian ports	563	530	500	473	485
Slag: ^e					
80% TiO ₂ , f.o.b. Sorel, Quebec	292	294	338	390	349
85% TiO ₂ , f.o.b. Richards Bay, South Africa	353	390	385	406	413
Stocks, mine, distributor and consumer, yearend:					
Ilmenite	267	234	270	343	300
Rutile	77	80	111	96	100
Employment, mine and mill, number ^e	400	400	450	450	450
Net import reliance ⁴ as a percent of reported consumption	57	68	76	75	76

Recycling: None.

Import Sources (1996-99): Ilmenite and slag: South Africa, 53%; Australia, 27%; Canada, 11%; India, 5%; and other, 4%. Natural and synthetic rutile: Australia, 53%; South Africa, 39%; Malaysia, 2%; India, 1%; and other, 5%.

Tariff: Item	Number	Normal Trade Relations 12/31/00
Synthetic rutile	2614.00.3000	Free.
Ilmenite and ilmenite sand	2614.00.6020	Free.
Rutile concentrate	2614.00.6040	Free.
Titanium slag	2620.90.5000	Free.

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

Government Stockpile: None.

Events, Trends, and Issues: Global production of ilmenite and slag in 2000 was estimated to be nearly unchanged when compared with that of 1999. Domestic consumption of ilmenite and titanium slag concentrates in 2000 was estimated to increase 4% when compared with that of 1999. In 2000, the United States continued its reliance on imported feedstocks primarily from Australia and South Africa.

Development efforts were proceeding at the minerals sands deposits near Camden, TN. At yearend, construction of a heavy mineral separation pilot plant was near completion.

In Australia, numerous exploration and development studies were underway in the Murray Basin, Western Australia. In the fourth quarter, a new heavy mineral concentrator commenced production at Eneabba North, Western Australia.

Feasibility studies continued at Kwale, Kenya, and Corridor Sands, Mozambique. In addition, a drilling program was underway at Truro, Nova Scotia, Canada. Production from Kwale, Kenya, was scheduled for 2002.

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Fewer environmental pollution problems are encountered when pigment is produced from rutile rather than ilmenite. The chloride process, using a rutile feed, generates about 0.2 ton of waste per ton of TiO₂ product; the sulfate process, using ilmenite, generates about 3.5 tons of waste per ton of product. Producing synthetic rutile from ilmenite results in about 0.7 ton of waste, mainly iron oxide, per ton of product. Direct chlorination of ilmenite generates about 1.2 tons of waste, mainly ferric chloride, per ton of TiO₂.

World Mine Production, Reserves, and Reserve Base:

	<u>Mine production</u>		<u>Reserves⁵</u>	<u>Reserve base⁵</u>
	<u>1999</u>	<u>2000⁹</u>		
Ilmenite:				
United States	⁶ 300	⁶ 300	13,000	59,000
Australia	1,140	1,100	⁷ 100,000	⁷ 140,000
Canada ⁸	760	760	31,000	36,000
India	204	205	30,000	38,000
Norway ⁸	266	270	40,000	40,000
South Africa ⁸	935	935	63,000	63,000
Ukraine	225	286	5,900	13,000
Other countries	<u>283</u>	<u>259</u>	<u>63,000</u>	<u>98,000</u>
World total (ilmenite, rounded)	4,100	4,000	350,000	480,000
Rutile:				
United States	(⁹)	(⁹)	700	1,800
Australia	181	226	⁷ 19,000	⁷ 53,000
India	15	15	6,600	7,700
South Africa	122	122	8,300	8,300
Ukraine	45	45	2,500	2,500
Other countries	<u>8</u>	<u>8</u>	<u>7,900</u>	<u>100,000</u>
World total (rutile, rounded)	¹⁰ 370	¹⁰ 410	45,000	170,000
World total (ilmenite and rutile, rounded)	4,500	4,500	390,000	660,000

World Resources: Ilmenite supplies about 90% of the world's demand for titanium minerals. World ilmenite resources total about 1 billion tons of titanium dioxide. Identified world resources of rutile (including anatase) total about 230 million tons of contained TiO₂.

Substitutes: Ilmenite, leucosene, rutile, slag, and synthetic rutile compete as feedstock sources for producing TiO₂ pigment, titanium metal, and welding rod coatings. In the future, commercial processes may be developed to use anatase and perovskite.

⁹Estimated.

¹See also Titanium and Titanium Dioxide.

²Rounded to one significant digit to avoid revealing company proprietary data.

³Excludes ilmenite used to produce synthetic rutile.

⁴Defined as imports - exports + adjustments for Government and industry stock changes.

⁵See Appendix C for definitions.

⁶Includes rutile to avoid revealing company proprietary data.

⁷Derived from data published by the Australian Bureau of Resource Sciences.

⁸Mine production is primarily used to produce titaniferous slag. Reserves and reserve base are ilmenite.

⁹Included with ilmenite to avoid revealing company proprietary data.

¹⁰Excludes the United States.