ILMENITE[1]

(Data in thousand metric tons of contained TiO_2, unless noted)

Domestic Production and Use: Two firms produced ilmenite concentrate from three heavy-mineral sands operations in Florida and one produced ilmenite in California as a byproduct of sand and gravel production. Based on average prices, the value of U.S. ilmenite consumption in 1995 was about $250 million. Major coproducts of ilmenite from heavy mineral sand deposits are rutile and zircon. About 99% of the ilmenite and titanium slag was consumed by five titanium pigment producers. The remainder was used in welding rod coatings and for manufacturing alloys, carbide, and chemicals.

Salient Statistics—United States:	1991	1992	1993	1994	1995[e]
Production	W	W	W	W	W
Imports for consumption[2]	462	615	564	584	608
Exports[e]	12	16	7	9	12
Consumption:[2] Reported	751	882	889	W	920
Apparent	W	W	W	W	W
Price, dollars per metric ton:					
Ilmenite:					
Bulk, 54% TiO_2, f.o.b. Australian ports	72	65	63	77	80
Slag:[e]					
80% TiO_2, f.o.b. Sorel, Quebec	293	276	276	278	300
85% TiO_2, f.o.b. Richards Bay, South Africa	293	322	330	334	350
Stocks, mine, distributor and consumer, yearend[2]	218	254	218	208	200
Employment, mine and mill[3]	395	400	395	400	400
Net import reliance[4] as a percent of apparent consumption	W	W	W	W	W

Recycling: None.

Import Sources (1991-94): South Africa, 60%; Australia, 25%; Canada, 10%; and other, 5%.

Tariff: Item	Number	Most favored nation (MFN) 12/31/95	Non-MFN[5] 12/31/95
Ilmenite and ilmenite sand	2614.00.6020	Free	Free.
Titanium slag	2620.90.5000	Free	Free.

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

Government Stockpile: None.

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ILMENITE

Events, Trends, and Issues: Another record year of titanium pigment production resulted in a moderate increase in the domestic consumption of ilmenite plus titanium slag. Total imports of ilmenite plus slag increased about 4% with Australia, Canada, and South Africa contributing more than 75% of imports. Imports from Brazil, India, and Ukraine increased significantly.

Exploration and development of titanium mineral deposits were on the rise in 1995. In South Africa, a new producer of titanium concentrates was expected to commission a titanium slag operation by yearend. At full production, the operation was expected to produce 195,000 tons per year of slag. In Western Australia, plans were announced to proceed with the development of the Beenup deposit. The deposit was reported to be 4% heavy mineral sands and low in impurities with the potential for 500,000 tons per year of ilmenite.

Domestic environmental problems related to ilmenite include (1) land use conflicts where heavy-mineral sands deposits exist principally along the Atlantic coast and (2) the potential for water pollution from pigment-producing processes. Solutions to the latter problem include the development of economic, environmentally acceptable processes for making synthetic rutile or titanium tetrachloride from lower grade ilmenites and the development of methods to recover and recycle spent sulfuric acid as well as to neutralize and control the effluents produced. The two U.S. producers using the sulfate process treated their spent acid effluent with calcium carbonate and lime, producing a gypsum byproduct.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves[6]	Reserve base[6]
	1994	1995[e]		
United States	W	W	8,000	59,000
Australia	1,010	1,030	33,000	88,000
Brazil	50	50	18,000	18,000
Canada (slag)	611	610	31,000	36,000
China	78	80	30,000	41,000
Egypt	—	—	—	1,700
Finland	—	—	1,400	1,400
India	162	170	30,000	38,000
Italy	—	—	—	2,200
Madagascar	—	—	—	19,000
Malaysia	159	160	—	1,000
Norway (ilmenite and slag)	315	320	40,000	40,000
South Africa (slag)	632	750	63,000	63,000
Sri Lanka	32	30	13,000	13,000
Ukraine	75	100	5,900	13,000
Other countries	32	8	1,000	1,000
World total (rounded)	[7]3,160	[7]3,310	270,000	440,000

World Resources: Ilmenite supplies about 90% of the world's demand for titaniferous material. World ilmenite resources total about 1 billion tons of titanium dioxide. Major resources occur in Australia, Canada, China, India, New Zealand, Norway, South Africa, Ukraine, and the United States.

Substitutes: Rutile and synthetic rutile were extensively used to produce titanium dioxide pigment.

[e]Estimated. W Withheld to avoid disclosing company proprietary data.

[1]See also Rutile and Titanium and Titanium Dioxide.

[2]Includes titanium slag from Canada, Norway, and South Africa and leucoxene from Australia.

[3]Includes operating employees shown under Rutile, subject to the same footnoted comments.

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

[5]See Appendix B.

[6]See Appendix C for definitions.

[7]Excludes U.S. production.

RUTILE[1]

(Data in thousand metric tons of contained TiO_2, unless noted)

Domestic Production and Use: Rutile was produced at one mine in Florida. At two other mines in Florida, rutile was included in a bulk concentrate containing mostly ilmenite and leucoxene. The major coproduct of these mines is zircon. Synthetic rutile was produced at one plant in Alabama. The value of U.S. rutile consumption in 1995, including synthetic rutile, was about $240 million. Two firms, with facilities in Nevada and Oregon, used titanium tetrachloride primarily made from rutile to manufacture titanium. Of 16 consuming firms, mainly in the Eastern United States, 5 companies used 96% of the rutile consumed to produce titanium dioxide (TiO_2) pigment. Welding-rod coatings and miscellaneous applications, which include fiberglass and titanium metal, consumed 4%.

Salient Statistics—United States:	1991	1992	1993	1994	1995[e]
Production	W	W	W	W	W
Imports for consumption[2]	226	299	349	311	300
Exports[e]	4	7	3	4	9
Shipments from Government stockpile excesses	—	—	1	18	17
Consumption: Reported[2]	336	438	436	478	490
Apparent	W	W	W	W	W
Price, dollars per ton of rutile, yearend:					
Bulk, f.o.b. Australian ports	545	405	378	420	600
Bulk, f.o.b. U.S. east coast	628	NA	NA	NA	NA
Stocks, mine, distributor and consumer, yearend	197	140	179	141	130
Employment, mine and mill[3]	395	400	395	400	400
Net import reliance[4] as a percent of apparent consumption	W	W	W	W	W

Recycling: None.

Import Sources (1991-94): Australia, 50%; South Africa, 26%; Sierra Leone, 22%; and other, 2%.

Tariff: Item	Number	Most favored nation (MFN) 12/31/95	Non-MFN[5] 12/31/95
Rutile concentrate	2614.00.6040	Free	Free.
Synthetic rutile	2614.00.3000	5% ad val.	30% ad val.

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

Government Stockpile:

Stockpile Status—9-30-95

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposals Jan.-Sept. 95
Stockpile-grade rutile (gross weight)	0.27	12.3	0.03	16.9

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RUTILE

Events, Trends, and Issues: Another record year of titanium pigment production resulted in a slight increase in the domestic consumption of natural and synthetic rutile. Total imports of the two forms of rutile decreased about 4%. Australia and South Africa supplied about 95% of total imports.

Early in 1995, rebel forces took control of mining operations at Sierra Leone's sole producer of natural rutile. Although control of the mine was later regained by Government forces, the mine was not believed to be operating at yearend. The operation was the largest natural rutile operation in the world and supplied about one-third of the world's supply of natural rutile.

Prices for rutile and synthetic rutile concentrates increased significantly in 1995. Rising prices were driven by the loss of Sierra Leone as a major source of supply and an upswing in global demand for pigments.

The Defense Logistics Agency (DLA) continued its program to dispose of rutile held in the National Defense Stockpile (NDS). As of September, DLA had awarded almost all of the rutile held in the Government's NDS. Only 267 dry tons of rutile were left in the NDS as uncommitted inventory.

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 TiO_2 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 TiO_2.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves[6]	Reserve base[6]
	1994	1995[e]		
United States	W	W	500	1,800
Australia	212	220	4,300	43,000
Brazil	2	2	40	85,000
India	13	13	6,600	7,700
Italy	—	—	—	8,800
Sierra Leone	131	40	3,100	3,100
South Africa	73	80	8,300	8,300
Sri Lanka	2	2	4,800	4,800
Ukraine	3	3	2,500	2,500
World total (may be rounded)	[7]440	[7]360	30,000	160,000

World Resources: Identified world resources of rutile (including anatase) total about 230 million tons of contained TiO_2. Major rutile resources occur in Australia, India, Italy, Sierra Leone, South Africa, and the United States.

Substitutes: Ilmenite, titaniferous slag, and synthetic rutile made from ilmenite may be used instead of natural rutile for making pigment, metal, and welding-rod coatings.

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data.

[1]See also Ilmenite and Titanium and Titanium Dioxide.

[2]Includes synthetic rutile.

[3]Employment at three sand deposit operations in Florida, which produced either rutile concentrate or a titanium mineral concentrate, where ilmenite and zircon were major coproducts and where employees were not assigned to specific commodities.

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

[5]See Appendix B.

[6]See Appendix C for definitions.

[7]Excludes U.S. production.