

## TITANIUM AND TITANIUM DIOXIDE<sup>1</sup>

(Data in metric tons unless otherwise noted)

**Domestic Production and Use:** Titanium sponge metal was produced by three operations in Nevada, Oregon, and Utah. Ingot was produced by eight operations in eight States. Numerous firms consumed ingot to produce wrought products and castings. In 2006, an estimated 72% of the titanium metal was used in aerospace applications. The remaining 28% was used in armor, chemical processing, marine, medical, power generation, sporting goods, and other nonaerospace applications. The value of sponge metal consumed was about \$315 million, assuming an average selling price of \$10.50 per kilogram.

In 2006, titanium dioxide (TiO<sub>2</sub>) pigment, which was valued at about \$3.5 billion, was produced by four companies at eight facilities in seven States. The estimated use of TiO<sub>2</sub> pigment by end use was paint (includes lacquers and varnishes), 54%; plastic, 27%; paper, 16%; and other, 3%. Other uses of TiO<sub>2</sub> included catalysts, ceramics, coated fabrics and textiles, floor coverings, printing ink, and roofing granules.

<b>Salient Statistics—United States:</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006<sup>e</sup></b>
Titanium sponge metal:					
Production	W	W	W	W	W
Imports for consumption	10,700	9,590	11,900	15,800	25,100
Exports	2,810	5,000	2,410	1,910	1,210
Shipments from Government stockpile excesses	5,400	6,820	3,910	2,510	—
Consumption, reported	17,300	17,100	21,200	27,000	30,000
Price, dollars per kilogram, yearend	8.02	6.50	8.50	9.23	13.50
Stocks, industry yearend <sup>e</sup>	11,700	8,180	7,660	4,330	6,520
Employment, number <sup>e</sup>	300	300	300	300	300
Net import reliance <sup>2</sup> as a percentage of reported consumption	46	87	66	73	72
Titanium dioxide:					
Production	1,410,000	1,420,000	1,540,000	1,310,000	1,360,000
Imports for consumption	231,000	240,000	264,000	341,000	380,000
Exports	540,000	584,000	635,000	524,000	600,000
Consumption, apparent	1,110,000	1,070,000	1,170,000	1,130,000	1,140,000
Price, rutile, list, dollars per pound, yearend	0.90	0.88	1.00	1.15	1.17
Stocks, producer, yearend	145,000	156,000	NA	NA	NA
Employment, number <sup>e</sup>	4,500	4,500	4,400	4,300	4,300
Net import reliance <sup>2</sup> as a percentage of apparent consumption	E	E	E	E	E

**Recycling:** New scrap metal recycled by the titanium industry totaled about 600 tons in 2006. Estimated use of titanium as scrap and ferrotitanium by the steel industry was about 8,000 tons; by the superalloy industry, 1,300 tons; and, in other industries, 1,500 tons. Old scrap reclaimed totaled about 600 tons.

**Import Sources (2002-05):** Sponge metal: Kazakhstan, 52%; Japan, 40%; Russia, 7%; and other, 1%. Titanium dioxide pigment: Canada, 29%; Germany, 10%; China, 9%; France, 8%; and other, 44%.

<b>Tariff:</b>	<b>Item</b>	<b>Number</b>	<b>Normal Trade Relations</b>
			<b>12-31-06</b>
	Titanium oxides (unfinished TiO <sub>2</sub> pigments)	2823.00.0000	5.5% ad val.
	TiO <sub>2</sub> pigments, 80% or more TiO <sub>2</sub>	3206.11.0000	6.0% ad val.
	TiO <sub>2</sub> pigments, other	3206.19.0000	6.0% ad val.
	Ferrotitanium and ferrosilicon titanium	7202.91.0000	3.7% ad val.
	Titanium waste and scrap metal	8108.30.0000	Free.
	Unwrought titanium metal	8108.20.0000	15.0% ad val.
	Wrought titanium metal	8108.90.6000	15.0% ad val.
	Other titanium metal articles	8108.90.3000	5.5% ad val.

**Depletion Allowance:** Not applicable.

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**Government Stockpile:** The Defense National Stockpile Center continued the sale of titanium sponge held in the Government stockpile. In fiscal year 2006, the remaining inventory of sponge was exhausted.

Material	Uncommitted inventory	Stockpile Status—9-30-06 <sup>3</sup>		Disposal plan FY 2006	Disposals FY 2006
		Committed inventory	Authorized for disposal		
Titanium sponge	—	—	—	—	679

**Events, Trends, and Issues:** Domestic production of TiO<sub>2</sub> pigment was an estimated 1.4 million tons, a slight increase compared with that of 2005. Global production of TiO<sub>2</sub> was estimated to have increased 3% compared with that of 2005. In January, the hurricane-damaged DeLisle, MS, TiO<sub>2</sub> plant resumed operation. In Saudi Arabia, production capacity at the Yanbu TiO<sub>2</sub> pigment plant was raised to 120,000 tons per year and was expected to increase to 180,000 tons per year by 2008. TiO<sub>2</sub> pigment capacity at Greatham, United Kingdom, was expected to increase to 150,000 tons per year in 2007. In 2006, rising demand from commercial aircraft and military markets significantly increased the production and consumption of titanium metal. Domestic and international titanium metal producers were adding capacity to keep pace with rising demand. In Albany, OR, an idle sponge plant was restarted in 2006 and was expected to reach a capacity of 7,260 tons per year by yearend 2007. In Rowley, UT, a new 10,900-ton-per-year sponge plant was expected to begin producing in 2008. In Henderson, NV, sponge capacity was expected to increase to 12,600 tons per year by yearend. China's sponge capacity is expected to rise to 47,500 tons per year by 2008. Japan's sponge capacity is expected to rise to 52,000 tons per year by 2009. Russian production capacity is expected to increase to 44,000 tons per year by 2008 and 56,000 tons per year by 2012. Several concerted efforts to develop a low-cost method for producing titanium metal were ongoing.

### **World Sponge Metal Production and Sponge and Pigment Capacity:**

	Sponge production		Capacity 2006 <sup>4</sup>	
	2005	2006 <sup>e</sup>	Sponge	Pigment
United States	W	W	12,300	1,580,000
Australia	—	—	—	241,000
Belgium	—	—	—	74,000
Canada	—	—	—	90,000
China <sup>e</sup>	9,510	14,500	15,000	500,000
Finland	—	—	—	130,000
France	—	—	—	225,000
Germany	—	—	—	440,000
Italy	—	—	—	80,000
Japan	30,800	35,000	39,000	317,000
Kazakhstan <sup>e</sup>	19,000	23,000	23,000	1,000
Mexico	—	—	—	125,000
Russia <sup>e</sup>	29,000	32,000	32,000	20,000
Spain	—	—	—	80,000
Ukraine <sup>e</sup>	8,100	8,100	10,000	120,000
United Kingdom	—	—	—	290,000
Other countries	—	—	—	670,000
World total (rounded)	<sup>5</sup> 96,000	<sup>5</sup> 110,000	130,000	5,000,000

**World Resources:**<sup>6</sup> Resources and reserves of titanium minerals are discussed in Titanium Mineral Concentrates. The commercial feedstock sources for titanium are ilmenite, leucoxene, rutile, slag, and synthetic rutile.

**Substitutes:** There are few materials that possess titanium metal's strength-to-weight ratio and corrosion resistance. In high-strength applications, titanium competes with aluminum, composites, intermetallics, steel, and superalloys. For applications that require corrosion resistance, aluminum, nickel, specialty steels, and zirconium alloys may be substituted for titanium. Ground calcium carbonate, precipitated calcium carbonate, kaolin, and talc compete with titanium dioxide as a white pigment.

<sup>e</sup>Estimated. E Net exporter. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.

<sup>1</sup>See also Titanium Mineral Concentrates.

<sup>2</sup>Defined as imports – exports + adjustments for Government and industry stock changes.

<sup>3</sup>See Appendix B for definitions.

<sup>4</sup>Operating capacity.

<sup>5</sup>Excludes U.S. production.

<sup>6</sup>See Appendix C for definitions.