

TITANIUM AND TITANIUM DIOXIDE¹

(Data in metric tons unless otherwise noted)

Domestic Production and Use: Titanium sponge metal was produced by 3 operations in Nevada and Utah, and titanium ingot was produced by 10 operations in 8 States. Domestic and imported ingot was consumed by numerous firms to produce wrought products and castings. In 2015, an estimated 77% of titanium metal was used in aerospace applications. The remaining 23% was used in armor, chemical processing, marine hardware applications, medical implants, power generation, sporting goods, and other applications. Assuming an average purchase price of \$9.86 per kilogram, the value of sponge metal consumed was about \$302 million.

In 2015, titanium dioxide (TiO₂) pigment, which was produced by four companies at six facilities in five States, was valued at about \$3.0 billion. The estimated end-use distribution of TiO₂ pigment consumption was paint (includes lacquers and varnishes), 60%; plastic, 20%; paper, 12%; and other, 8%. Other uses of TiO₂ included catalysts, ceramics, coated fabrics and textiles, floor coverings, printing ink, and roofing granules.

Salient Statistics—United States:	2011	2012	2013	2014	2015^e
Titanium sponge metal:					
Production	W	W	W	W	W
Imports for consumption	33,800	33,600	19,900	17,700	22,600
Exports	256	1,420	1,860	2,220	1,640
Consumption, reported	48,400	35,100	24,600	26,400	30,600
Price, dollars per kilogram, yearend	10.35	11.78	11.57	11.00	9.93
Stocks, industry yearend ^e	10,800	18,100	25,200	22,900	26,800
Employment, number ^e	300	300	300	300	300
Net import reliance ² as a percentage of reported consumption	69	71	44	58	68
Titanium dioxide pigment:					
Production	1,290,000	1,140,000	1,280,000	1,260,000	1,160,000
Imports for consumption	200,000	203,000	213,000	224,000	242,000
Exports	790,000	625,000	671,000	685,000	655,000
Consumption, apparent ³	706,000	722,000	826,000	802,000	747,000
Producer price index, yearend	268	268	236	224	190
Employment, number ^e	3,400	3,400	3,400	3,400	3,100
Net import reliance ² as a percentage of apparent consumption	E	E	E	E	E

Recycling: About 51,000 tons of scrap metal was recycled by the titanium industry in 2015. Estimated use of titanium scrap by the steel industry was about 10,200 tons; by the superalloy industry, 500 tons; and by other industries, 1,200 tons.

Import Sources (2011–14): Sponge metal: Japan, 59%; Kazakhstan, 17%; China, 13%; and other, 11%. Titanium dioxide pigment: Canada, 37%; China, 22%; Germany, 10%; and other, 31%.

Tariff:	Item	Number	Normal Trade Relations 12–31–15
	Titanium oxides (unfinished TiO ₂ pigments)	2823.00.0000	5.5% ad val.
	TiO ₂ pigments, 80% or more TiO ₂	3206.11.0000	6.0% ad val.
	TiO ₂ pigments, other	3206.19.0000	6.0% ad val.
	Ferrotitanium and ferrosilicon titanium	7202.91.0000	3.7% ad val.
	Unwrought titanium metal	8108.20.0000	15.0% ad val.
	Titanium waste and scrap metal	8108.30.0000	Free.
	Other titanium metal articles	8108.90.3000	5.5% ad val.
	Wrought titanium metal	8108.90.6000	15.0% ad val.

Depletion Allowance: Not applicable.

Government Stockpile: None.

Events, Trends, and Issues: Based on increased imports, domestic consumption of titanium sponge in 2015 was estimated to have increased by 15% from that in 2014, owing to increased demand from the aerospace industry as production begins on next generation titanium-intensive aircraft. The operator of the titanium sponge plant in Rowley, UT, completed necessary certifications for using titanium sponge produced in its plant for use in rotating jet engine

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parts. A titanium producer in Kazakhstan and its joint-venture partner, a titanium forging company in France, entered into a project with a regional bank and a Government agency in France to build a plant to recycle aviation-grade titanium in Saint-Georges-de-Mons, France. The joint venture would provide the European manufacturing industry with a new supply chain for aerospace-grade titanium independent of sources in the United States and Russia. In July, a major titanium producer in Russia signed an agreement to provide semifinished titanium products to a British jet engine manufacturer and, in August, announced an agreement with a company in China to provide titanium mill products for use in civilian aircraft. In November, a titanium producer in Ukraine began a program to certify its titanium sponge for the aerospace market.

Domestic production of TiO₂ pigment in 2015 was estimated to be about 1.16 million tons, an 8% decrease from that of 2014, owing to closure of a pigment plant in Delaware and closure of two production lines—one at a plant in Mississippi and one at a plant in Tennessee. Similar closures took place in other countries owing to global overcapacity, excess inventories, and stagnant demand. In China, multiple pigment plants representing at least 280,000 tons per year of capacity were closed owing to overcapacity and (or) environmental issues. Two companies in China announced a merger that would make the combined company the world's fourth largest producer with a capacity of 540,000 tons per year of TiO₂ pigment. In Mexico, upgrades to a chloride-route pigment plant were expected to be completed in 2016, which would increase the capacity of the plant to 200,000 tons per year.

World Sponge Metal Production and Sponge and Pigment Capacity:

	Sponge production		Capacity 2015 ⁴	
	2014	2015 ^e	Sponge	Pigment
United States	W	W	24,500	1,090,000
Australia	—	—	—	260,000
Belgium	—	—	—	85,000
Canada	—	—	—	105,000
China ^e	110,000	80,000	140,000	3,000,000
Finland	—	—	—	130,000
France	—	—	—	125,000
Germany	—	—	—	456,000
Italy	—	—	—	80,000
Japan ^e	25,000	30,000	64,500	310,000
Kazakhstan ^e	9,000	9,000	26,000	1,000
Mexico	—	—	—	130,000
Russia ^e	42,000	42,000	46,500	20,000
Spain	—	—	—	80,000
Ukraine ^e	7,200	9,000	12,000	120,000
United Kingdom	—	—	—	300,000
Other countries	500	500	500	887,000
World total (rounded)	⁵ 194,000	⁵ 171,000	316,000	7,200,000

World Resources:⁶ The commercial feedstocks for titanium are ilmenite, leucoxene, rutile, slag, and synthetic rutile. For information on resources and reserves of titanium minerals, see Titanium Mineral Concentrates.

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

^eEstimated. E Net exporter. W Withheld to avoid disclosing company proprietary data. — Zero.

¹See also Titanium Mineral Concentrates.

²Defined as imports – exports.

³Defined as production + imports – exports.

⁴Yearend operating capacity.

⁵Excludes U.S. production.

⁶See [Appendix C](#) for resource/reserve definitions and information concerning data sources.