

VANADIUM

(Data in metric tons of vanadium content unless otherwise noted)

Domestic Production and Use: In 2014, seven U.S. firms that compose most of the domestic vanadium industry produced ferrovanadium, vanadium pentoxide, vanadium metal, and vanadium-bearing chemicals or specialty alloys by processing materials such as petroleum residues, spent catalysts, utility ash, and vanadium-bearing pig iron slag. In 2009–2013, small amounts of vanadium were produced as a coproduct from the mining of uraniumiferous sandstones on the Colorado Plateau. All coproduct vanadium production for 2014 was suspended. Metallurgical use, primarily as an alloying agent for iron and steel, accounted for about 93% of the domestic vanadium consumption in 2014. Of the other uses for vanadium, the major nonmetallurgical use was in catalysts for the production of maleic anhydride and sulfuric acid.

Salient Statistics—United States:	2010	2011	2012	2013	2014^e
Production, mine, mill	1,060	590	106	591	—
Imports for consumption:					
Ferrovanadium	1,340	2,220	4,190	3,710	4,200
Vanadium pentoxide, anhydride	4,000	2,810	1,640	2,040	3,400
Oxides and hydroxides, other	167	886	905	205	200
Aluminum-vanadium master alloys (gross weight)	63	86	115	169	180
Ash and residues	1,010	1,510	2,210	4,190	3,500
Sulfates	48	42	29	30	32
Vanadates	158	303	280	276	300
Vanadium metal, including waste & scrap (gross weight)	10	44	154	35	22
Exports:					
Ferrovanadium	611	314	337	259	350
Vanadium pentoxide, anhydride	140	98	62	77	120
Oxides and hydroxides, other	1,100	254	287	358	280
Aluminum-vanadium master alloys (gross weight)	133	318	432	347	300
Vanadium metal, including waste & scrap (gross weight)	21	102	26	52	50
Consumption:					
Apparent	5,940	7,580	8,540	10,200	10,800
Reported	5,030	4,140	3,980	3,980	4,000
Price, average, dollars per pound V ₂ O ₅	6.46	6.76	6.49	6.04	5.80
Stocks, consumer, yearend	248	¹ 193	¹ 223	¹ 220	¹ 235
Net import reliance ² as a percentage of apparent consumption	82	92	99	94	100

Recycling: The quantity of vanadium recycled from spent chemical process catalysts was significant and may compose as much as 40% of total supply. Some tool steel scrap was recycled primarily for its vanadium content but this only accounted for a small percentage of total vanadium used.

Import Sources (2010–13): Ferrovanadium: Czech Republic, 39%; Canada, 23%; Republic of Korea, 19%; Austria, 17%; and other, 2%. Vanadium pentoxide: Russia, 42%; South Africa, 38%; China, 15%; and other, 5%.

Tariff: Ash, residues, slag, and waste and scrap enter duty-free.

Item	Number	Normal Trade Relations <u>12–31–14</u>
Vanadium pentoxide anhydride	2825.30.0010	5.5% ad val.
Vanadium oxides and hydroxides, other	2825.30.0050	5.5% ad val.
Vanadates	2841.90.1000	5.5% ad val.
Ferrovanadium	7202.92.0000	4.2% ad val.
Vanadium and articles thereof ³	8112.99.2000	2.0% ad val.

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

Government Stockpile: None.

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Events, Trends, and Issues: U.S. reported consumption of vanadium in 2014 was about the same as that of 2013. Among the major uses for vanadium, production of carbon, full-alloy, and high-strength low-alloy steels accounted for 15%, 43%, and 35%, respectively, of domestic consumption. U.S. imports for consumption of vanadium in 2014 increased by 11% from those of the previous year. U.S. exports increased slightly from those of the previous year.

Vanadium pentoxide (V_2O_5) prices stayed at \$5.80 per pound from January 2014 through June 2014. U.S. ferrovanadium (FeV) prices slowly increased starting in November 2013 and continued to increase into 2014. In June 2014, prices averaged \$19.06 per pound of FeV.

World Mine Production and Reserves: Reserves for Australia were updated with data from Geoscience Australia.

	Mine production		Reserves ⁴ (thousand metric tons)
	<u>2013</u>	<u>2014^e</u>	
United States	591	—	45
Australia	400	—	1,800
China	41,000	41,000	5,100
Russia	15,000	15,000	5,000
South Africa	21,000	21,000	3,500
Other countries	<u>600</u>	<u>600</u>	<u>NA</u>
World total (rounded)	<u>79,000</u>	<u>78,000</u>	<u>15,000</u>

World Resources: World resources of vanadium exceed 63 million tons. Vanadium occurs in deposits of phosphate rock, titaniferous magnetite, and uraniferous sandstone and siltstone, in which it constitutes less than 2% of the host rock. Significant amounts are also present in bauxite and carboniferous materials, such as coal, crude oil, oil shale, and tar sands. Because vanadium is typically recovered as a byproduct or coproduct, demonstrated world resources of the element are not fully indicative of available supplies. While domestic resources and secondary recovery are adequate to supply a large portion of domestic needs, a substantial part of U.S. demand is currently met by foreign sources.

Substitutes: Steels containing various combinations of other alloying elements can be substituted for steels containing vanadium. Certain metals, such as manganese, molybdenum, niobium (columbium), titanium, and tungsten, are to some degree interchangeable with vanadium as alloying elements in steel. Platinum and nickel can replace vanadium compounds as catalysts in some chemical processes. Currently, no acceptable substitute for vanadium is available in aerospace titanium alloys.

^eEstimated. NA Not available. — Zero.

¹Does not include vanadium pentoxide.

²Defined as imports – exports + adjustments for Government and industry stock changes.

³Aluminum-vanadium master alloy consisting of 35% aluminum and 64.5% vanadium.

⁴See [Appendix C](#) for resource/reserve definitions and information concerning data sources.