

VANADIUM

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

Domestic Production and Use: Eight U.S. firms that make up the 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 iron slag. Metallurgical use, primarily as an alloying agent for iron and steel, accounted for about 90% of the vanadium consumed domestically. 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:	2000	2001	2002	2003	2004^e
Production, mine, mill ¹	—	—	—	—	—
Imports for consumption:					
Ash, ore, residues, slag	1,890	1,670	990	1,630	1,830
Vanadium pentoxide, anhydride	902	600	406	474	1,230
Oxides and hydroxides, other	14	1,080	42	39	193
Aluminum-vanadium master alloys (gross weight)	16	10	98	232	33
Ferrovanadium	2,510	2,550	2,520	1,360	3,260
Exports:					
Vanadium pentoxide, anhydride	653	71	91	185	376
Oxides and hydroxides, other	100	63	203	284	709
Aluminum-vanadium master alloys (gross weight)	677	363	529	671	807
Ferrovanadium	172	70	142	397	214
Consumption, reported	3,520	3,210	3,080	2,960	3,350
Price, average, dollars per pound V ₂ O ₅	1.82	1.37	1.34	2.21	5.28
Stocks, consumer, yearend	303	251	221	220	219
Employment, mine and mill, number ¹	—	—	—	—	—
Net import reliance ² as a percentage of reported consumption	100	100	100	100	100

Recycling: Some tool steel scrap was recycled primarily for its vanadium content, and vanadium was recycled from spent chemical process catalysts, but these two sources together accounted for only a very small percentage of total vanadium used. The vanadium content of other recycled steels was lost to slag during processing and was not recovered.

Import Sources (2000-03): Ferrovanadium: Czech Republic, 25%; South Africa, 20%; Canada, 17%; China, 14%; and other, 24%. Vanadium pentoxide: South Africa, 95%; Mexico, 2%; and other, 3%.

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

Item	Number	Normal Trade Relations <u>12-31-04</u>
Vanadium pentoxide anhydride	2825.30.0010	6.6% ad val.
Vanadium oxides and hydroxides, other	2825.30.0050	6.6% ad val.
Vanadates	2841.90.1000	6.1% ad val.
Ferrovanadium	7202.92.0000	4.2% ad val.
Aluminum-vanadium master alloys	7601.20.9030	Free.

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

Government Stockpile: None.

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Events, Trends, and Issues: Preliminary data indicate that U.S. vanadium consumption in 2004 increased about 13% from that of the previous year. Among the major uses for vanadium, production of high-strength low-alloy, full-alloy, and carbon steels accounted for 34%, 30%, and 29% of domestic consumption, respectively. Steel production in 2004 was expected to be 2% to 3% higher than that of 2003.

Both ferrovanadium and vanadium pentoxide prices increased significantly during 2004. Industry publications attributed the price rise primarily to a reduction in supply of material in the market and steady demand in the steel and aerospace industries. The oversupply on the world market in 2003 was reduced by the closure of the Windimurra Mine in Australia, the Vantec Mine in South Africa, and reduced production from the Tulachermet plant in Russia. High stock levels related to overproduction from 1999 to 2003 were gradually reduced during 2003, leading to balanced supply and demand in 2004.

World Mine Production, Reserves, and Reserve Base: Production data for China were revised downward to reflect lower estimated vanadium recovery from vanadiferous slags.

	Mine production		Reserves ³	Reserve base ³
	2003	2004 ^e		
United States	—	—	45,000	4,000,000
China	13,200	13,200	5,000,000	14,000,000
Russia	8,500	10,000	5,000,000	7,000,000
South Africa	18,000	20,000	3,000,000	12,000,000
Other countries	1,000	1,000	NA	1,000,000
World total (rounded)	41,000	44,000	13,000,000	38,000,000

World Resources: World resources of vanadium exceed 63 million tons. Vanadium occurs in deposits of titaniferous magnetite, phosphate rock, 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 crude oil, coal, oil shale, and tar sands. Because vanadium is usually 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 material because it is currently uneconomic to mine vanadium in the United States.

Substitutes: Steels containing various combinations of other alloying elements can be substituted for steels containing vanadium. Metals, such as columbium (niobium), manganese, molybdenum, 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. There is currently no acceptable substitute for vanadium in aerospace titanium alloys.

^eEstimated. NA Not available. — Zero.

¹Domestic vanadium mine production stopped in 1999.

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

³See [Appendix C](#) for definitions.