

VANADIUM

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

Domestic Production and Use: Eight firms make up the U.S. vanadium industry. These firms produce 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, accounts 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:	1999	2000	2001	2002	2003^e
Production, mine, mill	W	—	—	—	—
Imports for consumption:					
Ash, ore, residues, slag	1,650	1,890	1,670	1,870	1,600
Vanadium pentoxide, anhydride	208	902	600	406	660
Oxides and hydroxides, other	—	14	1,080	42	30
Aluminum-vanadium master alloys (gross weight)	1,210	16	10	98	300
Ferrovanadium	1,930	2,510	2,550	2,520	1,100
Exports:					
Vanadium pentoxide, anhydride	747	653	670	453	290
Oxides and hydroxides, other	70	100	385	443	330
Aluminum-vanadium master alloys (gross weight)	514	677	363	529	1,800
Ferrovanadium	213	172	70	142	480
Consumption, reported	3,620	3,520	3,210	3,080	3,400
Price, average, dollars per pound V ₂ O ₅	1.99	1.82	1.37	1.34	1.50
Stocks, consumer, yearend	348	303	251	221	220
Employment, mine and mill, number	400	400	400	400	400
Net import reliance ¹ as a percentage of reported consumption	76	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 (1999-2002): Ferrovanadium: South Africa, 26%; Czech Republic, 22%; Canada, 17%; China, 16%; and other, 19%. Vanadium pentoxide: South Africa, 91%; Mexico, 7%; and other, 2%.

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

Item	Number	Normal Trade Relations <u>12/31/03</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 2003 increased about 10% over that of the previous year. Among the major uses for vanadium, production of high-strength low-alloy, full-alloy, and carbon steels accounted for 33%, 29%, and 27% of domestic consumption, respectively. Steel production in 2003 was expected to be level with that of 2002.

Both ferrovanadium and vanadium pentoxide prices remained low during 2003. Industry publications attributed the low prices primarily to an oversupply of material on the market and flat demand in the steel and aerospace industries. The oversupply on the world market was reduced in 2003 by the closure of the Windimurra Mine in Australia (5,400 tons annual production capacity) and the temporary shutdown of the Tulachermet plant in Russia owing to management realignment. While supply and demand were almost balanced in 2003, high stock levels related to overproduction from 1999 to 2002 remained.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves ²	Reserve base ²
	<u>2002</u>	<u>2003^e</u>		
United States	—	—	45,000	4,000,000
China	33,000	35,000	5,000,000	14,000,000
Russia	8,000	9,000	5,000,000	7,000,000
South Africa	18,000	15,000	3,000,000	12,000,000
Other countries	<u>1,000</u>	<u>1,000</u>	NA	<u>1,000,000</u>
World total (rounded)	60,000	60,000	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 and recover 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. W Withheld to avoid disclosing company proprietary data. — Zero.

¹Defined as imports – exports + adjustments for Government and industry stock changes.

²See Appendix C for definitions.