

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 process material such as ferrophosphorus slag, petroleum residues, spent catalysts, utility ash, and vanadium-bearing iron slag to produce ferrovanadium, vanadium pentoxide, vanadium metal, and vanadium-bearing chemicals or specialty alloys. The ferrophosphorus slag was produced at a mine in Idaho. Metallurgical use, primarily as an alloying agent for iron and steel, accounts for more than 95% 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. With regard to total domestic consumption, major end-use distribution was as follows: carbon steel 29%; high-strength low-alloy steel, 25%; full alloy steel, 24%; tool steel, 9%; and other, 13%.

Salient Statistics—United States:	1995	1996	1997	1998	1999^e
Production:					
Mine, mill	W	W	W	W	W
Petroleum residues, recovered basis	1,990	3,730	^e 2,000	^e 2,000	NA
Imports for consumption:					
Ash, ore, residues, slag	2,530	2,270	2,950	2,400	2,200
Vanadium pentoxide, anhydride	547	485	711	847	600
Oxides and hydroxides, other	36	11	126	33	10
Aluminum-vanadium master alloys (gross weight)	36	2	11	298	300
Ferrovanadium	1,950	1,880	1,840	1,620	1,600
Exports:					
Vanadium pentoxide, anhydride	229	241	614	681	700
Oxides and hydroxides, other	1,010	2,670	385	232	100
Aluminum-vanadium master alloys (gross weight)	660	310	974	856	500
Ferrovanadium	340	479	446	579	400
Shipments from Government stockpile	416	201	260	—	—
Consumption: Reported	4,650	4,630	4,730	4,390	4,000
Price, average, dollars per pound V ₂ O ₅	2.80	3.19	3.90	5.47	2.00
Stocks, consumer, yearend	310	286	308	314	300
Employment, mine and mill, number	390	390	400	400	400
Net import reliance ¹ as a percent of reported consumption	84	31	94	78	80

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.

Import Sources (1995-98): Ferrovanadium: Canada, 47%; China, 15%; Czech Republic, 12%; South Africa, 11%; and other, 15%. Vanadium pentoxide: South Africa, 94%; China, 5%; and other, 1%.

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

Item	Number	Normal Trade Relations 12/31/99
Vanadium pentoxide anhydride	2825.30.0010	10.8% ad val.
Vanadium oxides and hydroxides, other	2825.30.0050	10.8% ad val.
Vanadates	2841.90.1000	8.4% ad val.
Ferrovanadium	7202.92.0000	4.2% ad val.
Aluminum-vanadium master alloys	7601.20.9030	Free.

Depletion Allowance: 23% (Domestic), 15% (Foreign).

Government Stockpile: Disposal of the vanadium pentoxide held in the National Defense Stockpile was completed in 1997.

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Events, Trends, and Issues: Vanadium consumption in the United States in 1999 declined slightly from that in 1998. Preliminary data indicated the following changes among the major uses for vanadium during the first 6 months of 1999: carbon steel decreased 30%; tool steel increased 26%; full alloy steel increased 5%; and high-strength low-alloy steel increased 5%.

Both ferrovanadium and vanadium pentoxide prices declined during 1999. Articles in various industry-related publications attributed the falling prices to a decline in vanadium consumption, combined with an increased supply of material.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves ²	Reserve base ²
	1998	1999 ^e		
United States	W	W	45,000	4,000,000
China	14,700	14,000	2,000,000	3,000,000
Russia	9,000	9,000	5,000,000	7,000,000
South Africa	17,000	16,000	3,000,000	12,000,000
Other countries	1,100	1,000	—	1,000,000
World total (may be rounded)	³ 41,800	³ 40,000	10,000,000	27,000,000

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 are adequate to supply current domestic needs, a substantial part of U.S. demand is currently met by foreign material because of price advantages.

Substitutes: Steels containing various combinations of other alloying elements can be substituted for steels containing vanadium. Metals such as columbium, 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.

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

²See Appendix C for definitions.

³Excludes U.S. mine production.