

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 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 34%; high-strength low-alloy steel, 26%; full alloy steel, 19%; tool steel, 6%; and other, 15%.

Salient Statistics—United States:	1997	1998	1999	2000	2001^e
Production, mine, mill	W	W	W	—	—
Imports for consumption:					
Ash, ore, residues, slag	2,950	2,400	1,650	1,890	2,000
Vanadium pentoxide, anhydride	711	847	208	902	700
Oxides and hydroxides, other	126	33	—	14	40
Aluminum-vanadium master alloys (gross weight)	11	298	1,210	16	10
Ferrovanadium	1,840	1,620	1,930	2,510	2,600
Exports:					
Vanadium pentoxide, anhydride	614	681	747	653	100
Oxides and hydroxides, other	385	232	70	100	100
Aluminum-vanadium master alloys (gross weight)	974	856	514	677	400
Ferrovanadium	446	579	213	172	100
Shipments from Government stockpile	260	—	—	—	—
Consumption, reported	4,710	4,380	3,620	3,520	3,600
Price, average, dollars per pound V ₂ O ₅	3.90	5.47	1.99	1.82	1.40
Stocks, consumer, yearend	323	336	348	282	200
Employment, mine and mill, number	400	400	400	400	400
Net import reliance ¹ as a percentage of reported consumption	94	78	76	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.

Import Sources (1997-2000): Ferrovanadium: Canada, 35%; South Africa, 21%; China, 21%; Austria, 9%; and other, 14%. Vanadium pentoxide: South Africa, 99%; and other, 1%.

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

Item	Number	Normal Trade Relations <u>12/31/01</u>
Vanadium pentoxide anhydride	2825.30.0010	8.6% ad val.
Vanadium oxides and hydroxides, other	2825.30.0050	8.6% ad val.
Vanadates	2841.90.1000	7.2% 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 2001 decreased 7% from that in 2000. Among the major uses for vanadium, carbon steel accounted for 33% of domestic consumption. Full alloy steel and high-strength low-alloy steel accounted for 21% and 24% of domestic consumption, respectively.

Both ferrovanadium and vanadium pentoxide prices remained low during 2001. Articles in various industry-related publications attributed the falling prices primarily to an increased supply of material.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves ²	Reserve base ²
	<u>2000</u>	<u>2001^e</u>		
United States	—	—	45,000	4,000,000
China	16,000	16,000	2,000,000	3,000,000
Russia	9,000	9,000	5,000,000	7,000,000
South Africa	^e 17,000	17,000	3,000,000	12,000,000
Other countries	<u>1,000</u>	<u>1,000</u>	NA	<u>1,000,000</u>
World total (may be rounded)	43,000	43,000	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. — Zero.

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

²See Appendix C for definitions.