VANADIUM

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

Domestic Production and Use: The U.S. vanadium industry consisted of nine firms, but only eight had active operations. Raw materials included Idaho ferrophosphorus slag, petroleum residues, spent catalysts, utility ash, and vanadium-bearing iron slag. The chief use of vanadium was as an alloying agent for iron and steel. Vanadium was also important in the production of aerospace titanium alloys and as a catalyst for the production of maleic anhydride and sulfuric acid. Major end-use distribution was as follows: transportation, 27%; building and heavy construction, 33%; machinery and tools, 28%; and other, 12%.

Salient Statistics—United States:	1992	1993	1994	1995	1996[e]
Production:					
Mine, recoverable basis	W	W	W	W	W
Mill, recovered basis[1]	W	W	W	W	W
Petroleum residues, recovered basis	1,350	2,870	2,830	1,990	2,650
Imports for consumption:					
Ores, slag, residues	838	1,450	1,900	1,900	1,750
Vanadium pentoxide, anhydride	206	70	294	547	460
Oxides and hydroxides, other	103	19	3	36	25
Aluminum-vanadium master alloys (gross weight)	50	19	38	78	90
Ferrovanadium	592	1,630	1,910	1,950	1,900
Exports:					
Vanadium pentoxide, anhydride	26	126	335	229	250
Oxides and hydroxides, other	1,110	895	1,050	1,010	1,100
Aluminum-vanadium master alloys (gross weight)	60	866	1,030	660	700
Other compounds	2,020	989	—	—	—
Ferrovanadium	213	219	374	340	350
Shipments from Government stockpile	—	—	—	—	—
Consumption: Reported	4,080	3,970	4,280	4,640	4,700
Apparent	W	W	W	W	W
Price, average, dollars per pound V_2O_5	2.28	1.45	2.95	2.80	3.19
Stocks, producer and consumer, yearend	1,080	900	1,110	1,100	980
Employment, mine and mill, number	430	430	400	390	390
Net import reliance[2] as a percent of apparent consumption	W	W	W	W	W

Recycling: Some tool steel scrap was recycled primarily for its vanadium content. Vanadium was also recycled as a minor component of scrap iron and steel alloys, which were recycled principally for their iron content. An increasing amount of vanadium was also recycled from spent chemical process catalysts.

Import Sources (1992-95):[3] South Africa, 33%; Canada, 17%; Russia, 12%; Mexico, 6%; Germany, 5%; and other, 27%.

Tariff: Item	Number	Most favored nation (MFN) 12/31/96	Non-MFN[4] 12/31/96
Slag	2619.00.9000	Free	Free.
Ash and residues	2620.50.0000	Free	Free.
Vanadium pentoxide anhydride	2825.30.0010	13.9% ad val.	40% ad val.
Vanadium oxides and hydroxides, other	2825.30.0050	16.0% ad val.	40% ad val.
Vanadates	2841.90.1000	10.1% ad val.	40% ad val.
Ferrovanadium	7202.92.0000	4.2% ad val.	25% ad val.
Aluminum-vanadium master alloys	7601.20.9030	Free	10.5% ad val.
Waste and scrap	8112.40.3000	Free	Free.

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

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VANADIUM

Government Stockpile:

Material	Stockpile Status—9-30-96 Uncommitted inventory	Committed inventory	Authorized for disposal	Disposals Jan.-Sept. 96
Vanadium pentoxide	373	17	146	89

Events, Trends, and Issues: The U.S. International Trade Commission (ITC) determined on June 22, 1995, that ferrovanadium and nitrided vanadium imports from Russia caused injury to U.S. industry, and Russian exporters to the United States were subjected to antidumping deposits. The result of the ITC action was that Russia lost its role as the top supplier of ferrovanadium to the U.S. market. U.S. ferrovanadium imports in 1995 totaled 1,954 tons, an increase of only 9% over 1994 imports. Russia accounted for 59% of 1994 imports, but only 8% in 1995. Belgium, China, the Czech Republic, the Republic of Korea, and South Africa, none of which shipped ferrovanadium to the United States in 1994, made up the difference in imports from Russia. Together they accounted for 47% of imports in 1995. Ferrovanadium imports in the first 6 months of 1996 totaled 855 tons. The Czech Republic increased its share of imports from 15% in all of 1995 to 31% in the first 7 months of 1996. Canada was in first place with a 34% share, while Russia declined to less than 4%.

Vanadium consumption in the United States for the first 7 months of 1996 increased by about 9% over consumption in the first 7 months of 1995. Consumption in the two largest end use categories, carbon steel and full alloy steel, increased by 12% and 40%, respectively. Consumption in the tool steel end use category was essentially unchanged, while consumption in the high-strength low-alloy end use category decreased 16%.

World Mine Production, Reserves, and Reserve Base:

	Mine production 1995	Mine production 1996[e]	Reserves[5]	Reserve base[5]
United States	W	W	45,000	4,000,000
Australia	—	—	30,000	350,000
Brazil	—	—	—	24,000
China	5,000	5,500	2,000,000	3,000,000
Finland	—	—	—	100,000
Russia	10,000	10,500	5,000,000	7,000,000
South Africa	15,500	16,000	3,000,000	12,000,000
Other countries	3,200	3,500	—	1,000,000
World total (may be rounded)	[6]33,700	[6]36,000	10,000,000	27,000,000

World Resources: World resources of vanadium exceeded 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. Among various metals that are to some degree interchangeable with vanadium as alloying elements in steel are columbium, manganese, molybdenum, titanium, and tungsten. 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.

[e]Estimated. W Withheld to avoid disclosing company proprietary data.

[1]Produced from domestic materials.

[2]Defined as imports - exports + adjustments for Government and industry stock changes.

[3]The European Union, Canada, and Austria produced vanadium alloys and chemicals solely from imported raw materials.

[4]See Appendix B.

[5]See Appendix C for definitions.

[6]Excludes U.S. mine production and production from petroleum residues.