

VANADIUM

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

Domestic Production and Use: Eight U.S. firms that make up the domestic 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 pig iron slag. Metallurgical use, primarily as an alloying agent for iron and steel, accounted for about 90% of the domestic vanadium consumption in 2006. 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:	2002	2003	2004	2005	2006^e
Production, mine, mill ¹	—	—	—	—	—
Imports for consumption:					
Ash, ore, residues, slag	1,870	3,060	2,350	1,690	700
Vanadium pentoxide, anhydride	406	474	1,040	1,370	2,370
Oxides and hydroxides, other	66	74	120	186	231
Aluminum-vanadium master alloys (gross weight)	98	232	19	1	153
Ferrovanadium	2,520	1,360	3,020	11,900	2,220
Exports:					
Vanadium pentoxide, anhydride	91	185	240	254	334
Oxides and hydroxides, other	203	284	584	899	998
Aluminum-vanadium master alloys (gross weight)	529	677	887	1,850	2,700
Ferrovanadium	142	397	285	504	437
Consumption, reported	3,080	3,240	4,050	3,910	3,810
Price, average, dollars per pound V ₂ O ₅	1.34	2.21	5.99	16.28	8.08
Stocks, consumer, yearend	221	250	336	371	340
Employment, mine and mill, number ¹	—	—	—	—	—
Net import reliance ² as a percentage of apparent 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 (2002-05): Ferrovanadium: Czech Republic, 74%; Swaziland, 9%; Canada, 8%; Austria, 4%; and other, 5%. Vanadium pentoxide: South Africa, 82%; China, 9%; Mexico, 5%; and other, 4%.

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

Item	Number	Normal Trade Relations 12-31-06
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 2006 decreased about 2% from that of the previous year. Among the major uses for vanadium, production of carbon, full-alloy, and high-strength low-alloy steels accounted for 25%, 27%, and 27% of domestic consumption, respectively. Steel production in 2006 was expected to be 1% to 2% higher than that of 2005.

Both ferrovanadium and vanadium pentoxide prices decreased significantly in 2006 from 2005 levels. Prices that had spiked in the second quarter of 2005 dropped by about 50% by the end of the year, and the trend continued into 2006 with prices stabilizing at about one-half of their 2005 levels for ferrovanadium and vanadium pentoxide, respectively. Stable demand in the steel and aerospace industries and increased production of vanadium in Russia and China kept world supply and demand in balance in 2006.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves ³	Reserve base ³
	2005	2006 ^e		
United States	—	—	45,000	4,000,000
China	17,000	17,500	5,000,000	14,000,000
Russia	15,100	18,800	5,000,000	7,000,000
South Africa	25,000	25,000	3,000,000	12,000,000
Other countries	1,100	1,100	NA	1,000,000
World total (rounded)	58,200	62,400	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.