

COLUMBIUM (NIOBIUM)

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

Domestic Production and Use: No significant U.S. columbium mine production has been reported since 1959. Domestic columbium resources are of low grade, some mineralogically complex, and most are not commercially recoverable. Five companies produced ferrocolumbium and columbium compounds, metal, and other alloys from imported columbium minerals, oxides, and ferrocolumbium. Consumption was mainly as ferrocolumbium by the steel industry and as columbium alloys and metal by the aerospace industry. Major end-use distribution of reported columbium consumption was as follows: carbon steels, 35%; superalloys, 32%; high-strength low-alloy steels, 12%; alloy steels, 10%; stainless and heat-resisting steels, 10%; and other, 1%. In 2006, the estimated value of reported columbium consumption, in the form of ferrocolumbium and nickel-columbium alloy, was \$118 million. Reported columbium consumption for 2002, 2003, and 2004 was revised based on review of existing survey data.

<u>Salient Statistics—United States:</u>¹	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006^e</u>
Production, mine	—	—	—	—	—
Imports for consumption:					
Mineral concentrates ^e	273	181	167	142	112
Columbium metal and alloys ^e	673	743	940	1,380	1,450
Columbium oxide ^e	654	585	633	660	710
Ferrocolumbium ^e	4,030	4,080	5,180	5,430	8,490
Exports, concentrate, metal, alloys ^e	111	143	196	340	560
Government stockpile releases ^{e,2}	19	182	112	128	85
Consumption, reported, ferrocolumbium ^{e,3}	2,740	3,220	3,760	4,170	4,620
Consumption, apparent	5,520	5,600	6,750	7,410	10,300
Price, ferrocolumbium, dollars per pound ⁴	6.60	6.58	6.56	7.32	7.62
Net import reliance ⁵ as a percentage of apparent consumption	100	100	100	100	100

Recycling: Columbium was recycled when columbium-bearing steels and superalloys were recycled; scrap recovery specifically for columbium content was negligible. The amount of columbium recycled is not available, but it may be as much as 20% of apparent consumption.

Import Sources (2002-05): Brazil, 80%; Canada, 10%; Estonia, 3%; Germany, 2%; and other, 5%.

<u>Tariff:</u>	<u>Item</u>	<u>Number</u>	<u>Normal Trade Relations</u>
			<u>12-31-06</u>
	Columbium ores and concentrates	2615.90.6030	Free.
	Columbium oxide	2825.90.1500	3.7% ad val.
	Ferrocolumbium:		
	Less than 0.02% of P or S, or less than 0.4% of Si	7202.93.4000	5.0% ad val.
	Other	7202.93.8000	5.0% ad val.
	Columbium, unwrought:		
	Waste and scrap	8112.92.0500	Free.
	Alloys, metal, powders	8112.92.4000	4.9% ad val.
	Columbium, other	8112.99.0100	4.0% ad val.

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

Government Stockpile: For fiscal year 2006, the Defense National Stockpile Center (DNSC), Defense Logistics Agency, disposed of 76 tons of columbium contained in columbium-tantalum mineral concentrates (no columbium value was obtained, as the columbium was contained within tantalum minerals) and about 9 tons of vacuum-grade columbium metal valued at about \$261,000 from the National Defense Stockpile. The DNSC's ferrocolumbium inventory was exhausted in fiscal year 2001, and its columbium carbide inventory was exhausted in fiscal year 2002. The DNSC announced maximum disposal limits for fiscal year 2007 of about 254 tons⁶ of columbium contained in columbium concentrates and about 9 tons⁶ of columbium metal ingots.

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Material	Stockpile Status—9-30-06 ⁷			Disposal plan FY 2006	Disposals FY 2006
	Uncommitted inventory	Committed inventory	Authorized for disposal		
Columbium:					
Concentrates	22	—	22	254	—
Metal	10	—	10	9	9

Events, Trends, and Issues: Columbium ferroalloys domestic demand in steelmaking increased about 19% compared with that of 2005, columbium demand in superalloys (mostly for aircraft engine components) decreased about 2% compared with that of 2005, and overall apparent consumption rose about 38%. Columbium imports increased about 41% compared with those of 2005, driven by a 56% increase in ferrocolumbium imports. Brazil accounted for about 84% of the total quantity of imports and about 84% of the value. Overall exports rose 66% owing to a 45% increase in ferrocolumbium exports to Canada, to about 467 tons in 2006 from about 322 tons in 2005. The published price for standard-grade (steelmaking-grade) ferrocolumbium was quoted at \$7.62 per pound of columbium content. Public information on current prices for other columbium products was not available. According to industry sources, prices for columbium oxide, columbium metal, other columbium chemicals, and various columbium alloys are variable and depend on product specifications, volume, and processing considerations. Pricing is normally established by negotiation between buyer and seller.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves ⁸	Reserve base ⁸
	2005	2006 ^e		
United States	—	—	—	Negligible
Australia	200	200	29,000	NA
Brazil	35,000	56,000	4,300,000	5,200,000
Canada	3,310	3,500	110,000	NA
Congo (Kinshasa)	25	25	NA	NA
Ethiopia	7	11	NA	NA
Mozambique	34	35	NA	NA
Nigeria	40	80	NA	NA
Rwanda	63	65	NA	NA
Other countries ⁹	NA	NA	NA	NA
World total (rounded)	38,700	59,900	4,400,000	5,200,000

World Resources: World resources are more than adequate to supply projected needs. Most of the world's identified resources of columbium occur mainly as pyrochlore in carbonatite deposits and are outside the United States. The United States has approximately 150,000 tons of columbium resources in identified deposits, all of which were considered uneconomic at 2006 prices for columbium.

Substitutes: The following materials can be substituted for columbium, but a performance or cost penalty may ensue: molybdenum and vanadium as alloying elements in high-strength low-alloy steels; tantalum and titanium as alloying elements in stainless and high-strength steels; and ceramics, molybdenum, tantalum, and tungsten in high-temperature applications.

^eEstimated. NA Not available. — Zero.

¹Revisions principally based on reevaluation of import and export data.

²Net quantity (uncommitted inventory).

³Includes nickel columbium.

⁴Average of yearend trade journal reported prices, per pound of contained columbium, standard (steelmaking) grade; columbite prices were not available.

⁵Defined as imports – exports + adjustments for Government and industry stock changes.

⁶Actual quantity limited to remaining sales authority; additional legislative authority is required.

⁷[See Appendix B for definitions.](#)

⁸[See Appendix C for definitions.](#) Reserve and reserve base entries indicated by "NA" are believed to be small compared with the totals shown.

⁹Bolivia, Burundi, China, Russia, Zambia, and Zimbabwe also produce (or are believed to produce) columbium mineral concentrates, but available information is inadequate to make reliable estimates of output levels.