

COLUMBIUM (NIOBIUM)

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

Domestic Production and Use: There has been no significant domestic columbium mining since 1959. Domestic columbium resources are of low grade, some mineralogically complex, and most are not commercially recoverable. Most metal, ferrocolumbium, other alloys, and compounds were produced by five companies. Feed for these plants included imported concentrates, columbium oxide, and ferrocolumbium. Consumption was mainly as ferrocolumbium by the steel industry and as columbium alloys and metal by the aerospace industry, with plants in the Eastern and Midwestern United States, California, and Washington. The estimated value of reported columbium consumption, in the form of ferrocolumbium and nickel columbium, in 2004, was about \$80 million. Major end-use distribution of reported columbium consumption was as follows: superalloys, 25%; carbon steels, 24%; high-strength low-alloy steels, 24%; alloy steels, 13%; stainless and heat-resisting steels, 13%; and other, 1%.

<u>Salient Statistics—United States:</u>	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004^e</u>
Production, mine	—	—	—	—	—
Imports for consumption:					
Mineral concentrates ^e	300	290	290	180	170
Columbium metal and alloys ^e	607	1,050	673	743	900
Columbium oxide ^e	1,190	1,360	660	590	600
Ferrocolumbium ^e	4,400	4,480	4,030	4,080	4,600
Exports, concentrate, metal, alloys ^e	100	110	100	170	300
Government stockpile releases ^{e,1}	217	(4)	9	223	72
Consumption, reported, ferrocolumbium ^{e,2}	4,090	4,230	3,150	3,650	3,900
Consumption, apparent	4,300	4,400	4,100	4,300	4,500
Price:					
Columbite, dollars per pound ³	6.25	NA	NA	NA	NA
Ferrocolumbium, dollars per pound ⁴	6.88	6.88	6.60	6.58	6.58
Net import reliance ⁵ as a percentage of apparent consumption	100	100	100	100	100

Recycling: Columbium was mostly recycled from products of columbium-bearing steels and superalloys; little was recovered from products specifically for their columbium content. Detailed data on the quantities of columbium recycled are not available but may be as much as 20% of apparent consumption.

Import Sources (2000-03): Brazil, 70%; Canada, 10%; Estonia, 5%; Germany, 4%; and other, 11%.

<u>Tariff: Item</u>	<u>Number</u>	<u>Normal Trade Relations</u>
		<u>12-31-04</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 2004, the Defense National Stockpile Center (DNSC), Defense Logistics Agency, disposed of about 204 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 columbium metal valued at about \$304,000 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 in fiscal year 2005 of about 254 tons⁶ of columbium contained in columbium concentrates and about 9 tons⁶ of columbium metal ingots.

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Stockpile Status—9-30-04⁷

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 2004	Disposals FY 2004
Columbium:					
Carbide powder	—	—	—	—	—
Concentrates	309	12	309	254	204
Ferrocolumbium	—	—	—	—	—
Metal	28	—	28	9	9

Events, Trends, and Issues: For the first half of 2004, domestic demand for columbium ferroalloys in steelmaking and demand for columbium in superalloys (mostly for aircraft engine components) increased compared with that of the same period of 2003. Also, for the first half of the year, overall columbium imports increased; Brazil accounted for about 80% of the quantity and about 75% of the value. Overall exports rose substantially owing to a significant increase in ferrocolumbium exports to Canada. There were no published price quotes for columbium-bearing columbite and pyrochlore concentrates. The published price for standard-grade (steelmaking-grade) ferrocolumbium was quoted at a range of \$6.45 to \$6.70 per pound of columbium content. Public information on current prices for other columbium products was not available. According to industry sources, the price for columbium oxide, columbium metal, other columbium chemicals, and various columbium alloys that are derived from either pyrochlore or other columbium-bearing sources is variable and depends 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
	2003	2004 ^e		
United States	—	—	—	Negligible
Australia	230	240	29,000	NA
Brazil	29,000	29,000	4,300,000	5,200,000
Canada	3,280	3,300	110,000	NA
Congo (Kinshasa)	13	13	NA	NA
Ethiopia	6	6	NA	NA
Mozambique	34	35	NA	NA
Namibia	1	1	NA	NA
Nigeria	190	200	NA	NA
Rwanda	22	30	NA	NA
Uganda	3	3	NA	NA
Other countries ⁹	—	—	NA	NA
World total (rounded)	32,800	32,800	4,400,000	5,200,000

World Resources: Most of the world's identified resources of columbium are outside the United States and occur mainly as pyrochlore in carbonatite deposits. On a worldwide basis, resources are more than adequate to supply projected needs. The United States has approximately 150,000 tons of columbium resources in identified deposits, all of which were considered uneconomic at 2004 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.

¹Net quantity (uncommitted inventory). Parentheses indicate negative number (increase in inventory).

²Includes nickel columbium.

³Yearend average value, contained pentoxides for material having a Nb₂O₅ to Ta₂O₅ ratio of 10 to 1.

⁴Yearend average value, contained columbium, standard (steelmaking) grade.

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

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

⁷See [Appendix B](#) for definitions.

⁸See [Appendix C](#) for definitions.

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.