

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 six 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 2000 was about \$70 million. Major end-use distribution of reported columbium consumption was as follows: carbon steels, 35%; superalloys, 19%; high-strength low-alloy steels, 19%; stainless and heat-resisting steels, 18%; alloy steels, 8%; and other, 1%.

Salient Statistics—United States:	1996	1997	1998	1999	2000^e
Production, mine	—	—	—	—	—
Imports for consumption:					
Concentrates, tin slags, other ¹	NA	NA	NA	NA	NA
Ferrocolumbium ^e	2,970	4,260	4,900	4,450	4,400
Exports, concentrate, metal, alloys ^e	190	70	50	160	50
Government stockpile releases ^{e 2}	30	126	145	280	139
Consumption, reported, ferrocolumbium ^{e 3}	3,380	3,770	3,640	3,380	3,500
Consumption, apparent	3,830	4,030	4,150	4,100	4,200
Price: Columbite, dollars per pound ⁴	3.00	3.00	3.00	3.00	3.70
Pyrochlore, dollars per pound ⁵	NA	NA	NA	NA	NA
Stocks, industry, processor and consumer, yearend	NA	NA	NA	NA	NA
Employment	NA	NA	NA	NA	NA
Net import reliance ⁶ as a percent of apparent consumption	100	100	100	100	100

Recycling: While columbium is not recovered from scrap steel and superalloys containing it, recycling of these alloys is significant, and columbium content is reused. Data on the quantities of columbium recycled in this manner are not available.

Import Sources (1996-99): Brazil, 74%; Canada, 11%; Germany, 4%; Russia, 3%; and other, 8%.

Tariff: Item	Number	Normal Trade Relations 12/31/00
Columbium ores and concentrates	2615.90.6030	Free.
Columbium oxide	2825.90.1500	3.7% ad val.
Ferrocolumbium	7202.93.0000	5.0% ad val.
Columbium, unwrought:		
Waste and scrap	8112.91.0500	Free.
Alloys, metal, powders	8112.91.4000	4.9% ad val.
Columbium, wrought	8112.99.0000	4.0% ad val.

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

Government Stockpile: For fiscal year 2000, ending September 30, 2000, the Defense National Stockpile Center (DNSC) sold about 182 tons of columbium contained in ferrocolumbium valued at about \$2.79 million and about 9 tons of columbium metal ingots valued at about \$567,000 from the National Defense Stockpile (NDS). The DNSC disposed of about 78 tons of columbium contained in tantalum minerals that were sold in fiscal year 2000; no value obtained as columbium was contained within the tantalum minerals. There were no sales of columbium carbide powder in fiscal year 2000. The DNSC also proposed maximum disposal limits in fiscal year 2001 of about 68 tons of columbium contained in ferrocolumbium, about 10 tons⁷ of columbium contained in columbium carbide, about 170 tons of columbium contained in columbium concentrates, and about 9 tons of columbium metal ingots. The NDS uncommitted inventories shown below include about 313 tons of columbium contained in nonstockpile-grade concentrates.

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Stockpile Status—9-30-00⁸

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 2000	Disposals FY 2000
Columbium:					
Carbide powder	10	—	10	⁷ 10	—
Concentrates	597	69	597	170	⁹ 78
Ferrocolumbium	52	37	52	⁷ 181	182
Metal	55	—	55	9	9

Events, Trends, and Issues: For the first one-half year, domestic demand for columbium ferroalloys in steelmaking increased compared with the similar period of 1999, in line with an increase in raw steel production. Demand for columbium in superalloys increased, with aircraft engines the dominant end-use market. For the same period, overall columbium imports decreased slightly; the volume of ferrocolumbium imports from Brazil decreased while ferrocolumbium imports from Canada increased. Brazil continued as the leading supplier, providing more than 70% of total columbium imports. Exports decreased, with Germany, Mexico, and the Netherlands receiving most of the columbium materials. In November, the published price for columbite ore was quoted at a range of \$4.80 to \$5.30 per pound of pentoxide content. The published price for steelmaking-grade ferrocolumbium was quoted at a range of \$6.75 to \$7 per pound of columbium content, and high-purity ferrocolumbium was quoted at a range of \$17.50 to \$18 per pound of columbium content. Industry sources indicated in December 1999 that nickel columbium sold at about \$18.50 per pound of columbium content, columbium metal products sold in the range of about \$24 to \$100 per pound in ingot and special shape forms, and columbium oxide for master alloy production sold for about \$8.80 per pound.

No domestic columbium mine production is expected in 2001, and it is estimated that U.S. apparent consumption will be about 4,300 tons. Most of total U.S. demand will be met by columbium imports in upgraded forms.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves ¹⁰	Reserve base ¹⁰
	1999	2000 ⁹		
United States	—	—	—	Negligible
Australia	140	150	16,000	NA
Brazil	21,100	21,000	3,200,000	5,000,000
Canada	2,370	2,400	140,000	400,000
Congo (Kinshasa)	—	—	30,000	50,000
Nigeria	30	30	60,000	90,000
Other countries ¹¹	—	—	NA	NA
World total (rounded)	23,600	23,600	3,500,000	5,500,000

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 2000 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.

⁸Estimated. NA Not available.

¹Metal, alloys, synthetic concentrates, and columbium oxide.

²Net quantity (uncommitted inventory).

³Includes nickel columbium.

⁴Average value, contained pentoxides for material having a Nb₂O₅ to Ta₂O₅ ratio of 10 to 1.

⁵Average value, contained pentoxide.

⁶Defined as imports - exports + adjustments for Government and industry stock changes.

⁷Actual quantity limited to remaining sales authority or inventory.

⁸See Appendix B for definitions.

⁹Columbium units contained in the disposal of tantalum minerals.

¹⁰See Appendix C for definitions.

¹¹Bolivia, China, Russia, and Zambia also produce (or are thought to produce) columbium, but available information is inadequate to make reliable estimates of output levels.