

COLUMBIUM (NIOBIUM)

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

Domestic Production and Use: There has been no significant domestic columbium-mining industry 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 with seven plants. 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 1999 was more than \$60 million. Major end-use distribution of reported columbium consumption was as follows: carbon steels, 39%; superalloys, 19%; high-strength low-alloy steels, 16%; stainless and heat-resisting steels, 14%; alloy steels, 11%; and other, 1%.

Salient Statistics—United States:	1995	1996	1997	1998	1999^e
Production, mine	—	—	—	—	—
Imports for consumption:					
Concentrates, tin slags, other ¹	NA	NA	NA	NA	NA
Ferrocolumbium ^e	3,580	2,970	4,260	4,900	4,400
Exports, concentrate, metal, alloys ^e	370	190	70	50	150
Government stockpile releases ^{e 2}	—	30	130	150	NA
Consumption, reported, ferrocolumbium ^{e 3}	2,900	3,370	3,770	3,640	3,600
Consumption, apparent	3,800	3,800	3,900	4,000	3,900
Price: Columbite, dollars per pound ⁴	2.97	3.00	3.00	3.00	3.00
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 reutilized. Data on the quantities of columbium recycled in this manner are not available.

Import Sources (1995-98): Brazil, 74%; Canada, 12%; Germany, 4%; Russia, 3%; and other, 7%.

Tariff: Item	Number	Normal Trade Relations 12/31/99
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: 23% (Domestic), 15% (Foreign).

Government Stockpile: The Defense National Stockpile Center (DNSC) had authority under its Annual Materials Plan for fiscal year (FY) 1999 (October 1, 1998, through September 30, 1999) to sell about 181 tons of columbium contained in ferrocolumbium, about 10 tons of columbium contained in columbium carbide powder, about 91 tons of columbium contained in columbium concentrates, and about 9 tons of columbium metal ingots from the National Defense Stockpile (NDS). From November 1998 through April 1999, the DNSC sold about 178 tons of columbium contained in ferrocolumbium valued at about \$2.4 million. In June and September 1999, the DNSC sold a total of about 9 tons of columbium metal ingots valued at about \$474,000. The DNSC disposed of about 83 tons of columbium contained in tantalum concentrates. There were no sales of columbium carbide powder in FY 1999. The DNSC also proposed maximum disposal limits in FY 2000 of about 181 tons of columbium contained in ferrocolumbium, about 10 tons of columbium contained in columbium carbide, about 91 tons of columbium contained in columbium concentrates, and about 9 tons of columbium metal ingots. The NDS uncommitted inventories shown below include about 342 tons of columbium contained in nonstockpile-grade concentrates and about 103 tons of columbium contained in nonstockpile-grade ferrocolumbium.

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Stockpile Status—9-30-99⁷

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 1999	Disposals FY 1999
Columbium carbide powder	10	—	10	10	—
Columbium concentrates	677	49	677	91	⁸ 83
Columbium metal	64	9	64	9	9
Ferrocolumbium	230	5	230	181	178

Events, Trends, and Issues: For the first one-half year, domestic demand for columbium ferroalloys in steelmaking was down compared with the similar period of 1998, in line with a decrease in raw steel production. Demand for columbium in superalloys also declined owing to a soft superalloy market. For the same period, overall columbium imports decreased, with the volume of ferrocolumbium imports from Brazil down by almost 10%. Brazil continued as the leading supplier, providing more than 80% of total columbium imports. Exports increased, with the United Kingdom and Mexico receiving most of the columbium materials.

The quoted price for columbium materials remained unchanged through early November, columbite ore at a range of \$2.80 to \$3.20 per pound of contained pentoxide, steelmaking-grade ferrocolumbium at a range of \$6.75 to \$7 per pound of contained columbium, and high-purity ferrocolumbium at a range of \$17.50 to \$18 per pound of contained columbium. Industry sources indicated in August 1999 that nickel columbium sold at about \$18.50 per pound of contained columbium, and that columbium metal products sold in the range of about \$24 to \$100 per pound in ingot and special shape forms.

It is estimated that in 2000, domestic columbium mine production will be zero and U.S. apparent consumption will be about 4,000 tons. The majority of total U.S. demand will be met by columbium imports in upgraded forms.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves ⁹	Reserve base ⁹
	1998	1999 ⁶		
United States	—	—	—	Negligible
Australia	140	150	10,000	NA
Brazil	16,000	16,000	3,200,000	5,000,000
Canada	2,300	2,300	140,000	400,000
Congo (Kinshasa) ¹⁰	—	—	30,000	50,000
Nigeria	23	20	60,000	90,000
Other countries ¹¹	—	—	NA	NA
World total (rounded)	18,500	18,500	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 1999 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 superalloys; and ceramics, molybdenum, tantalum, and tungsten in high-temperature applications.

⁶Estimated. NA Not available.

⁷Metal, alloys, synthetic concentrates, and columbium oxide.

⁸Net quantity including effect of upgrading program.

⁹Includes 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.

⁷See Appendix B for definitions.

⁸Columbium units contained in the disposal of tantalum concentrates.

⁹See Appendix C for definitions.

¹⁰Formerly Zaire.

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