

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 1998 was more than \$70 million. Major end-use distribution of reported columbium consumption was as follows: carbon steels, 32%; superalloys, 27%; high-strength low-alloy steels, 16%; stainless and heat-resisting steels, 13%; alloy steels, 11%; and other, 1%.

Salient Statistics—United States:	1994	1995	1996	1997	1998^e
Production, mine	—	—	—	—	—
Imports for consumption:					
Concentrates, tin slags, and other ¹	NA	NA	NA	NA	NA
Ferrocolumbium ^e	2,590	3,580	2,970	4,260	4,900
Exports, concentrate, metal, and alloys ^e	320	370	190	70	50
Consumption, reported:					
Raw material	NA	NA	NA	NA	NA
Ferrocolumbium ^{e 2}	2,750	2,900	3,370	3,780	3,800
Consumption, apparent	3,700	3,800	3,800	3,900	4,000
Price: Columbium, dollars per pound ³	2.60	2.97	3.00	3.00	3.00
Pyrochlore, dollars per pound ⁴	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 ⁵ 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 re-utilized. Data on the quantities of columbium recycled in this manner are not available.

Import Sources (1994-97): Brazil, 70%; Canada, 17%; Germany, 4%; and other, 9%.

Tariff: Item	Number	Normal Trade Relations (NTR) 12/31/98	Non-NTR⁶ 12/31/98
Columbium ores and concentrates	2615.90.6030	Free	Free.
Columbium oxide	2825.90.1500	3.7% ad val.	25% ad val.
Ferrocolumbium	7202.93.0000	5.0% ad val.	25% ad val.
Columbium, unwrought:			
Waste and scrap	8112.91.0500	Free	Free.
Alloys, metal, and powders	8112.91.4000	4.9% ad val.	25% ad val.
Columbium, wrought	8112.99.0000	4.3% ad val.	45% ad val.

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

Government Stockpile: Sales of National Defense Stockpile (NDS) ferrocolumbium began in March 1997. According to the Defense Logistics Agency's (DLA) Annual Materials Plan (AMP) for fiscal year (FY) 1998, the maximum amount of ferrocolumbium that could be sold would be about 91 tons of columbium contained in ferrocolumbium. For the first quarter of FY 1998 (October 1, 1997 through December 31, 1997), the DLA sold about 90 tons of columbium contained in ferrocolumbium valued at about \$1.25 million. The sales effectively exhausted DLA's authority for ferrocolumbium disposals under the AMP in FY 1998. For FY 1999, the Department of Defense (DOD) planned to dispose of about 181 tons of columbium contained in ferrocolumbium. Also, the DOD proposed to dispose of about 10 tons of columbium contained in columbium carbide, about 91 tons of columbium contained in columbium concentrates, and about 9 tons of columbium contained in columbium metal ingots. The NDS uncommitted inventories shown below include about 343 tons of columbium contained in nonstockpile-grade concentrates and about 148 tons of columbium contained in nonstockpile-grade ferrocolumbium.

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Stockpile Status—9-30-98⁷

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 1998	Disposals FY 1998
Columbium:					
Carbide powder	10	—	—	—	—
Concentrates	760	—	—	—	—
Ferrocolumbium	409	5	295	91	90
Metal	73	—	—	—	—

Events, Trends, and Issues: For the first one-half year, domestic demand for columbium ferroalloys was strengthened by a 7% increase in raw steel production compared with that of the previous year. Additionally, demand for columbium in superalloys was up significantly, affected by a strong aerospace market. For the same period, overall columbium imports rose by about 7%, owing to the increased volume of ferrocolumbium imports from Brazil. Brazil was the leading supplier, providing about 80% of total imports. U.S. exports continued to decline.

In early November, the published price for columbite ore was quoted at a range of \$2.80 to \$3.20 per pound of contained columbium and tantalum pentoxides. The published price for steelmaking-grade ferrocolumbium was quoted at a range of \$6.75 to \$7 per pound of contained columbium, and high-purity ferrocolumbium was quoted at a range of \$17.50 to \$18 per pound of contained columbium. Industry sources indicated that nickel columbium sold at about \$19 per pound of contained columbium, and that columbium metal ingots sold in the range of about \$25 to \$35 per pound.

It is estimated that in 1999 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 ⁸	Reserve base ⁸
	1997	1998		
United States	—	—	—	Negligible
Australia	125	130	9,000	NA
Brazil	18,100	18,000	3,300,000	5,000,000
Canada	2,300	2,300	140,000	410,000
Congo (Kinshasa) ⁹	—	—	32,000	91,000
Nigeria	13	10	64,000	91,000
Other countries ¹⁰	—	—	NA	NA
World total (rounded)	20,600	20,400	3,500,000	5,600,000

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 1998 prices for columbium.

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

⁶Estimated. NA Not available.

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

²Includes nickel columbium.

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

⁴Average value, contained pentoxide.

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

⁶See Appendix B.

⁷See Appendix C for definitions.

⁸See Appendix D for definitions.

⁹Formerly Zaire.

¹⁰Bolivia, China, Russia, and Zambia also produce, or are believed to produce columbium, but available information is inadequate to make reliable estimates of output levels.