

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 1997 was about \$60 million. Major end-use distribution of reported columbium consumption was as follows: carbon steels, 29%; high-strength low-alloy steels, 24%; superalloys, 20%; alloy steels, 14%; stainless and heat-resisting steels, 12%; and other, 1%.

Salient Statistics—United States:	1993	1994	1995	1996	1997^e
Production, mine	—	—	—	—	—
Imports for consumption:					
Concentrates, tin slags, and other ¹	NA	NA	NA	NA	NA
Ferrocolumbium ^e	2,190	2,590	3,580	2,970	4,000
Exports, concentrate, metal, and alloys ^e	300	320	370	190	75
Consumption, reported:					
Raw material	NA	NA	NA	NA	NA
Ferrocolumbium ^{e 2}	2,470	2,750	2,900	3,020	3,000
Consumption, apparent	3,500	3,700	3,800	3,800	3,900
Price: Columbium, dollars per pound ³	2.67	2.60	2.97	3.00	3.00
Pyrochlore, dollars per pound ⁴	2.75	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: Insignificant.

Import Sources (1993-96): Brazil, 66%; Canada, 21%; Germany, 4%; and other, 9%.

Tariff: Item	Number	Most favored nation (MFN) 12/31/97	Non-MFN⁶ 12/31/97
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	4.6% 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 for each of fiscal years 1997 and 1998, the maximum amount of ferrocolumbium that could be sold would be about 91 tons of columbium contained in ferrocolumbium. For fiscal year (FY) 1997, ending September 30, 1997, the DLA sold about 37 tons of columbium contained in ferrocolumbium valued at \$537,000. For FY 1998, in October 1997, the DLA sold about 16 tons of columbium contained in ferrocolumbium valued at \$225,000. Additionally, the Department of Defense proposed to dispose of about 10 tons of columbium contained in columbium carbide and about 91 tons of columbium contained in columbium concentrates in FY 1998. 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—9-30-97⁷

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 1997	Disposals FY 1997
Columbium:					
Carbide powder	10	—	—	—	—
Concentrates	786	—	—	—	—
Ferrocolumbium	498	11	385	91	37
Metal	73	—	—	—	—

Events, Trends, and Issues: For the first one-half year, overall reported consumption of columbium increased by about 9% compared with that of the previous year. Consumption of columbium by the steelmaking sector rose by about 5%, while demand for columbium in superalloys was up by more than 20%. For the same period, overall columbium imports rose by more than 40%. Brazil was the leading supplier, providing more than 70% of total imports. Exports continued to decline owing to the diminished availability of Canadian pyrochlore concentrates for domestic steelmaking-grade ferrocolumbium production. This production was negligible in 1997. New steelmaking-grade ferrocolumbium capacity developed in Canada in late 1994 contributed to the rise in ferrocolumbium imports in 1997. In late October, 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.

It is estimated that in 1998 domestic columbium mine production will be zero and U.S. apparent consumption will be about 4 million kilograms. The majority of total U.S. demand will be supplied by columbium imports in upgraded forms.

World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves ^{e 8}	Reserve base ^{e 8}
	1996	1997 ^e		
United States	—	—	—	Negligible
Australia	112	120	NA	NA
Brazil	13,500	14,000	3,300,000	3,600,000
Canada	2,330	2,400	140,000	410,000
Congo (Kinshasa) ⁹	—	—	32,000	91,000
Nigeria	10	10	64,000	91,000
Zimbabwe	1	1	NA	NA
Other countries ¹⁰	—	1	6,000	9,000
World total (rounded)	16,000	16,500	3,500,000	4,200,000

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 360,000 tons of columbium resources in identified deposits, most of which were considered uneconomic at 1997 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.

^eEstimated. NA Not available.

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

²Includes nickel columbium and a small quantity of other columbium materials.

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.