

## NIOBIUM (COLUMBIUM)

(Data in metric tons, niobium content, unless otherwise specified)

**Domestic Production and Use:** Significant U.S. niobium mine production has not been reported since 1959. Companies in the United States produced niobium-containing materials from imported niobium concentrates, oxides, and ferroniobium. Niobium was consumed mostly in the form of ferroniobium by the steel industry and as niobium alloys and metal by the aerospace industry. Major end-use distribution of domestic niobium consumption was estimated as follows: steels, about 57%, and superalloys, about 43%. The estimated value of niobium consumption was \$430 million, as measured by the value of imports.

<b>Salient Statistics—United States:</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023<sup>e</sup></b>
Production, mine	—	—	—	—	—
Imports for consumption <sup>1</sup>	10,100	7,170	8,230	9,110	9,400
Exports <sup>1</sup>	655	787	992	687	980
Shipments from Government stockpile <sup>2</sup>	-84	-88	-1	—	NA
Consumption: <sup>e</sup>					
Apparent <sup>3</sup>	9,330	6,300	7,240	8,420	8,400
Reported <sup>4</sup>	6,680	6,040	6,160	3,540	3,000
Price, average unit value, ferroniobium, dollars per kilogram <sup>5</sup>	23	21	21	25	25
Net import reliance <sup>3</sup> as a percentage of apparent consumption	100	100	100	100	100

**Recycling:** Niobium was recycled when niobium-bearing steels and superalloys were recycled; scrap recovery, specifically for niobium content, was negligible. The amount of niobium recycled is not available, but it may be as much as 20% of apparent consumption.

**Import Sources (2019–22):** Niobium and tantalum ores and concentrates: Australia, 54%; Congo (Kinshasa), 11%; Rwanda, 9%; Mozambique, 7%; and other, 19%. Niobium oxide: Brazil, 76%; Thailand, 10%; Estonia, 5%; India, 3%; and other, 6%. Ferroniobium and niobium metal: Brazil, 66%; Canada, 28%; Russia, 3%, Germany, 1%, and other, 2%. Total imports: Brazil, 66%; Canada, 26%; and other, 8%. Of U.S. niobium material imports (by niobium content), 72% was ferroniobium, 18% was niobium metal, 9% was niobium oxide, and 1% was niobium ores and concentrates.

<b>Tariff:</b>	<b>Item</b>	<b>Number</b>	<b>Normal Trade Relations 12-31-23</b>
	Synthetic tantalum-niobium concentrates	2615.90.3000	Free.
	Niobium ores and concentrates	2615.90.6030	Free.
	Niobium oxide	2825.90.1500	3.7% ad valorem.
	Ferroniobium:		
	Less than 0.02% phosphorus or sulfur, or less than 0.4% silicon	7202.93.4000	5% ad valorem.
	Other	7202.93.8000	5% ad valorem.
	Niobium:		
	Waste and scrap <sup>6</sup>	8112.92.0700	Free.
	Powders and unwrought metal	8112.92.4000	4.9% ad valorem.
	Other <sup>6</sup>	8112.99.9100	4% ad valorem.

**Depletion Allowance:** 22% (domestic), 14% (foreign).

### **Government Stockpile:<sup>7</sup>**

<b>Material</b>	<b>FY 2023</b>		<b>FY 2024</b>	
	<b>Potential acquisitions</b>	<b>Potential disposals</b>	<b>Potential acquisitions</b>	<b>Potential disposals</b>
Ferroniobium	—	—	136	—

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**Events, Trends, and Issues:** In 2023, U.S. niobium apparent consumption (measured in niobium content) was estimated to be 8,400 tons, a slight decrease from that in 2022. One domestic company developing its Elk Creek project in Nebraska continued to wait for financing in 2023. The project, which would be the only niobium mine and primary niobium-processing facility in the United States, has secured all necessary construction permits and contracted 75% of its planned ferroniobium production for the first 10 years of operation. According to the results of a 2022 feasibility study, the facility was projected to produce 7,350 tons per year of ferroniobium over a 38-year mine life.

Brazil continued to be the world's leading niobium producer, accounting for approximately 90% of global production, followed by Canada with about 8%. According to international trade statistics under the Harmonized System code 7202.93 (ferroniobium), Brazil's total exports were 50,566 tons from January through August 2023, 28% less than during the same period in 2022. Most of Brazil's exports were sent to China, followed by the Netherlands and Singapore.

In 2023, a leading niobium producer in Brazil reported that its most recent \$60 million expansion project is set to initiate operations in 2024. The new facility is expected to broaden its niobium oxide production line, increasing production capacity by 3,000 tons per year of niobium oxide to target the battery market.

In 2023, another leading niobium producer in Brazil reported the approval for infrastructure construction focused on piling new waste ores to maintain mining operations. Preliminary operational licenses were obtained from Goias State environmental authorities, with final approvals expected in October 2023. Plans were also made for the relocation of niobium slag and facilities in the southern part of the phosphate mine.

### **World Mine Production and Reserves:**

	Mine production		Reserves <sup>8</sup>
	<u>2022</u>	<u>2023<sup>e</sup></u>	
United States	—	—	210,000
Brazil	75,600	75,000	16,000,000
Canada	6,700	7,000	1,600,000
Congo (Kinshasa)	710	540	NA
Russia	381	440	NA
Rwanda	199	190	NA
Other countries	127	150	NA
World total (rounded)	83,700	83,000	>17,000,000

**World Resources:**<sup>8</sup> World resources of niobium are more than adequate to supply projected needs. Most of the world's identified resources of niobium occur as pyrochlore in carbonatite (igneous rocks that contain more than 50%-by-volume carbonate minerals) deposits and are outside the United States.

**Substitutes:** The following materials can be substituted for niobium, but a performance loss or higher cost may ensue: ceramic matrix composites, molybdenum, tantalum, and tungsten in high-temperature (superalloy) applications; molybdenum, tantalum, and titanium as alloying elements in stainless and high-strength steels; and molybdenum and vanadium as alloying elements in high-strength low-alloy steels.

<sup>e</sup>Estimated. NA Not available. — Zero.

<sup>1</sup>Imports and exports include the estimated niobium content of ferroniobium, niobium and tantalum ores and concentrates, niobium oxide, and niobium powders and unwrought metal. Niobium content was estimated assuming the following: 28% niobium oxide (Nb<sub>2</sub>O<sub>5</sub>) content in niobium ores and concentrates; 16% Nb<sub>2</sub>O<sub>5</sub> content in tantalum ores and concentrates and synthetic concentrates; 100% niobium content in unwrought niobium metal (powders and other); and 65% niobium content in ferroniobium. Nb<sub>2</sub>O<sub>5</sub> is 69.904% niobium by weight.

<sup>2</sup>Defined for 2019–22 as change in total inventory from prior yearend inventory. If negative, increase in inventory. Beginning in 2023, Government stock changes no longer included.

<sup>3</sup>Defined for 2019–22 as imports – exports ± adjustments for Government and industry stock changes. Beginning in 2023, Government stock changes no longer included.

<sup>4</sup>Only includes ferroniobium and nickel niobium.

<sup>5</sup>Unit value is weighted average unit value of gross weight of U.S. ferroniobium trade (imports plus exports).

<sup>6</sup>This category includes niobium-containing material and other material.

<sup>7</sup>See Appendix B for definitions.

<sup>8</sup>See Appendix C for resource and reserve definitions and information concerning data sources.