

## NIOBIUM (COLUMBIUM)

(Data in metric tons of niobium content unless otherwise noted)

**Domestic Production and Use:** Significant U.S. niobium mine production has not been reported since 1959. Domestic niobium resources are of low grade, some are mineralogically complex, and most are not commercially recoverable. Companies in the United States produced niobium-containing materials from imported niobium minerals, 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 reported niobium consumption was as follows: steels, about 80%; and superalloys, about 20%. In 2015, the estimated value of niobium consumption was \$400 million, as measured by the value of imports.

<b>Salient Statistics—United States:</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015<sup>e</sup></b>
Production, mine	—	—	—	—	—
Imports for consumption <sup>e, 1</sup>	9,520	10,100	8,580	11,100	8,900
Exports <sup>e, 1</sup>	363	385	435	1,110	1,300
Government stockpile releases <sup>e, 2</sup>	—	—	—	—	—
Consumption: <sup>e</sup>					
Reported <sup>3</sup>	9,060	7,460	7,500	8,210	7,700
Apparent	9,160	9,730	8,140	10,000	7,600
Unit value, ferroniobium, dollars per metric ton <sup>4</sup>	41,825	43,658	43,415	42,000	42,000
Net import reliance <sup>5</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 (2011–14):** Niobium ore and concentrate: Brazil, 39%; Rwanda, 16%; Canada, 10%; Australia, 10%; and other, 25%. Niobium metal and oxide: Brazil, 83%; Canada, 12%; and other, 5%. Total imports: Brazil, 82%; Canada, 13%; and other, 5%. Of the U.S. niobium material imports, 99% (by gross quantity) was ferroniobium and niobium metal and oxide.

<b>Tariff:</b>	<b>Item</b>	<b>Number</b>	<b>Normal Trade Relations 12–31–15</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 val.
	Ferroniobium:		
	Less than 0.02% P or S, or less than 0.4% Si	7202.93.4000	5.0% ad val.
	Other	7202.93.8000	5.0% ad val.
	Niobium:		
	Waste and scrap <sup>6</sup>	8112.92.0600	Free.
	Unwrought, powders	8112.92.4000	4.9% ad val.
	Niobium, other <sup>6</sup>	8112.99.9000	4.0% ad val.

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

**Government Stockpile:** In the annual materials plan for FY 2016, the Defense Logistics Agency (DLA) Strategic Materials announced the 2016 maximum acquisition limit of 104.5 tons for ferroniobium.

### Stockpile Status—9–30–15<sup>7</sup>

<b>Material</b>	<b>Inventory</b>	<b>Disposal Plan FY 2015</b>	<b>Disposals FY 2015</b>
Niobium metal	10	—	—

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**Events, Trends, and Issues:** Niobium principally was imported in the form of ferroniobium and niobium unwrought metal, alloy, and powder. Based on data for part of 2015, U.S. niobium apparent consumption (measured in contained niobium) was estimated to be 7,600 metric tons, 24% less than that of 2014.

Brazil was the world's leading niobium producer with 90% of global production, followed by Canada with 9%. Brazil exported about 5,000 to 7,000 tons of ferroniobium per month, distributed among China, Europe, and the United States. The increase in electrical power cost in Brazil that caused suspended production at 13 ferroalloy operations did not affect two Brazilian ferroniobium producers. Both companies operated vertically integrated mine-to-plant supply chains. One company announced plans to take cost-savings measures. The other company planned to upgrade or order a new ferroniobium submerged-arc furnace, rated at 15 megavolt-amperes, for completion in 2016 or 2017.

One domestic company planned to exploit the only primary niobium deposit in the United States at its Elk Creek project in Nebraska, where it planned to begin production in 2017. One domestic company concluded an offtake agreement for ferroniobium with a second company. Under the 10-year agreement, the first company would purchase 3,750 tons of ferroniobium per year, which equated to about one-half of the second company's planned production.

The DLA Strategic Materials planned to acquire ferroniobium to address a U.S. stockpile shortfall.

### World Mine Production and Reserves:

	Mine production		Reserves <sup>8</sup>
	<u>2014</u>	<u>2015<sup>e</sup></u>	
United States	—	—	—
Brazil	50,000	50,000	4,100,000
Canada	5,480	5,000	200,000
Other countries	<u>420</u>	<u>1,000</u>	NA
World total (rounded)	55,900	56,000	>4,300,000

**World Resources:** 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. The United States has approximately 150,000 tons of niobium-identified resources, all of which were considered uneconomic at 2015 prices for niobium.

**Substitutes:** The following materials can be substituted for niobium, but a performance loss or higher cost 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.

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

<sup>1</sup>Imports and exports include the estimated niobium content of niobium and tantalum ores and concentrates, niobium oxide, ferroniobium, niobium unwrought alloys, metal, and powder.

<sup>2</sup>Government stockpile inventory reported by DLA Strategic Materials is the basis for estimating Government stockpile releases.

<sup>3</sup>Includes ferroniobium and nickel niobium.

<sup>4</sup>Unit value is mass-weighted average U.S. import value of ferroniobium assuming 65% niobium content. To convert dollars per metric ton to dollars per pound, divide by 2,205.

<sup>5</sup>Defined as imports – exports + adjustments for Government and industry stock changes.

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

<sup>7</sup>See [Appendix B](#) for definitions.

<sup>8</sup>See [Appendix C](#) for resource/reserve definitions and information concerning data sources.