

## MOLYBDENUM

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

**Domestic Production and Use:** U.S. mine production of molybdenum in 2016 decreased by 33% to about 31,600 tons, and was valued at about \$458 million (based on an average oxide price). Molybdenum ore was produced as a primary product at two mines—both in Colorado—whereas seven copper mines (four in Arizona and one each in Montana, Nevada, and Utah) recovered molybdenum as a byproduct. Three roasting plants converted molybdenite concentrate to molybdc oxide, from which intermediate products, such as ferromolybdenum, metal powder, and various chemicals, were produced. Iron and steel and superalloy producers accounted for about 76% of the molybdenum consumed.

<b>Salient Statistics—United States:</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016<sup>e</sup></b>
Production, mine	60,400	61,000	68,200	47,400	31,600
Imports for consumption	19,800	20,300	25,300	18,100	20,800
Exports	48,900	53,100	65,200	41,400	35,000
Consumption:					
Reported <sup>1</sup>	19,400	18,600	19,500	17,600	16,500
Apparent <sup>2</sup>	33,100	29,800	27,900	24,400	17,800
Price, average value, dollars per kilogram <sup>3</sup>	28.09	22.85	25.84	15.01	14.50
Stocks, consumer materials	1,770	1,820	2,010	1,880	1,800
Employment, mine and plant, number	940	960	1,000	950	920
Net import reliance <sup>4</sup> as a percentage of apparent consumption	E	E	E	E	E

**Recycling:** Molybdenum is recycled as a component of catalysts, ferrous scrap, and superalloy scrap. Ferrous scrap comprises revert scrap, and new and old scrap. Revert scrap refers to remnants manufactured in the steelmaking process. New scrap is generated by steel mill customers and recycled by scrap collectors and processors. Old scrap is largely molybdenum-bearing alloys recycled after serving their useful life. The amount of molybdenum recycled as part of new and old steel and other scrap may be as much as 30% of the apparent supply of molybdenum. There are no processes for the separate recovery and refining of secondary molybdenum from its alloys. Molybdenum is not recovered separately from recycled steel and superalloys, but the molybdenum content of the recycled alloys is significant, and the molybdenum content is reutilized. Recycling of molybdenum-bearing scrap will continue to be dependent on the markets for the principal alloy metals in which molybdenum is found, such as iron, nickel, and chromium.

**Import Sources (2012–15):** Ferromolybdenum: Chile, 77%; Canada, 11%; Republic of Korea, 5%; and other, 7%. Molybdenum ores and concentrates: Canada, 28%; Peru, 27%; Chile, 22%; Mexico, 22%; and other, 1%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Normal Trade Relations 12–31–16</b>
Molybdenum ore and concentrates, roasted	2613.10.0000	12.8¢/kg + 1.8% ad val.
Molybdenum ore and concentrates, other	2613.90.0000	17.8¢/kg.
Molybdenum chemicals:		
Molybdenum oxides and hydroxides	2825.70.0000	3.2% ad val.
Molybdates of ammonium	2841.70.1000	4.3% ad val.
Molybdates, all others	2841.70.5000	3.7% ad val.
Molybdenum pigments, molybdenum orange	3206.20.0020	3.7% ad val.
Ferroalloys, ferromolybdenum	7202.70.0000	4.5% ad val.
Molybdenum metals:		
Powders	8102.10.0000	9.1¢/kg + 1.2% ad val.
Unwrought	8102.94.0000	13.9¢/kg + 1.9% ad val.
Wrought bars and rods	8102.95.3000	6.6% ad val.
Wrought plates, sheets, strips, etc.	8102.95.6000	6.6% ad val.
Wire	8102.96.0000	4.4% ad val.
Waste and scrap	8102.97.0000	Free.
Other	8102.99.0000	3.7% ad val.

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

**Government Stockpile:** None.

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**Events, Trends, and Issues:** U.S. estimated mine output of molybdenum in 2016 decreased by 33% from that of 2015. U.S. imports for consumption increased by 15% from those of 2015, and U.S. exports decreased by 15% from those of 2015. Reported U.S. consumption of primary molybdenum products decreased by 6% from that of 2015. Apparent consumption of molybdenum concentrates decreased by 27% from that of 2015.

The average molybdenum price for 2016 was lower than that of 2015; however, molybdenum prices continued to increase from the low in November 2015 throughout October 2016. Primary molybdenum production continued at the Climax Mine in Lake County and Summit County, CO, and at the Henderson Mine in Clear Creek County, CO, but primary production at the Ashdown Mine in Humboldt County, NV, and at the Questa Mine in Taos County, NM, continued to be suspended. The Thompson Creek Mine in Custer County, ID, and the Mineral Park Mine in Mohave County, AZ, continued to be on care-and-maintenance status in 2016, owing to continued weak molybdenum prices. The Mission Mine in Pima County, AZ, did produce molybdenum in 2015, but did not produce any molybdenum in 2016. The decline in U.S. molybdenum production was attributed mainly to the closure of the Thompson Creek Mine, as well as a major decrease in production at the Bingham Canyon Mine in Salt Lake County, UT.

Global molybdenum production in 2016 decreased by 4% compared with 2015. The Chinese Government was expected to launch a new round of environmental inspections in 2016. Many Chinese producers will be forced to either shut down their molybdenum facilities permanently or upgrade their facilities to comply with tougher environmental standards. Most new molybdenum production that was expected in 2015–16 has not taken place and many of the expected new projects, except for Chile's Molyb plant, which shipped its first molybdenum concentrate in September 2016, have been delayed.

**World Mine Production and Reserves:** The reserves estimate for China was revised based on new information from the National Bureau of Statistics of China.

	Mine production		Reserves <sup>5</sup> (thousand tons)
	2015	2016 <sup>e</sup>	
United States	47,400	31,600	2,700
Armenia	7,200	7,000	150
Australia	—	—	190
Canada	2,300	1,700	260
Chile	52,600	52,000	1,800
China <sup>e</sup>	83,000	90,000	8,400
Iran	3,500	3,500	43
Kazakhstan	—	—	130
Kyrgyzstan	NA	NA	100
Mexico	11,300	12,300	130
Mongolia	2,000	2,500	160
Peru	20,200	20,000	450
Russia <sup>e</sup>	4,500	4,500	250
Turkey	900	1,000	100
Uzbekistan <sup>e</sup>	450	450	60
World total (rounded)	235,000	227,000	15,000

**World Resources:** Identified resources of molybdenum in the United States are about 5.4 million tons, and in the rest of the world, about 14 million tons. Molybdenum occurs as the principal metal sulfide in large low-grade porphyry molybdenum deposits and as an associated metal sulfide in low-grade porphyry copper deposits. Resources of molybdenum are adequate to supply world needs for the foreseeable future.

**Substitutes:** There is little substitution for molybdenum in its major application in steels and cast irons. In fact, because of the availability and versatility of molybdenum, industry has sought to develop new materials that benefit from its alloying properties. Potential substitutes include boron, chromium, niobium (columbium), and vanadium in alloy steels; tungsten in tool steels; graphite, tantalum, and tungsten for refractory materials in high-temperature electric furnaces; and cadmium-red, chrome-orange, and organic-orange pigments for molybdenum orange.

Estimated. E Net exporter. NA Not available. — Zero.

<sup>1</sup>Reported consumption of primary molybdenum products.

<sup>2</sup>Apparent consumption of molybdenum concentrates roasted to make molybdenum oxide.

<sup>3</sup>Time-weighted average price per kilogram of molybdenum contained in technical-grade molybdic oxide, as reported by CRU Group.

<sup>4</sup>Defined as imports – exports + adjustments for industry stock changes.

<sup>5</sup>See [Appendix C](#) for resource and reserve definitions and information concerning data sources.