

MOLYBDENUM

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

Domestic Production and Use: Total U.S. mine production of molybdenum concentrate increased slightly to 42,000 tons of contained molybdenum in 2022 compared with 41,100 tons in 2021. Molybdenum concentrate production at primary molybdenum mines continued at two U.S. operations in Colorado, accounting for 33% of total U.S. molybdenum concentrate production. Molybdenum concentrate production from mines where molybdenum was a byproduct continued at seven U.S. operations (four in Arizona and one each in Montana, Nevada, and Utah), accounting for 67% of total U.S. molybdenum concentrate production. Three roasting plants converted molybdenite concentrate to molybdic oxide, from which intermediate products, such as ferromolybdenum, metal powder, and various chemicals, were produced.

Salient Statistics—United States:

	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022^e</u>
Production, mine	41,400	43,600	51,100	41,100	42,000
Imports for consumption	37,300	34,200	24,700	30,200	33,000
Exports	48,200	67,200	62,500	60,000	53,000
Consumption:					
Reported ¹	16,700	16,400	15,800	15,900	16,000
Apparent ²	31,300	10,400	13,100	11,100	22,000
Price, average value, dollars per kilogram ³	27.04	26.50	19.90	35.30	39.25
Stocks, consumer materials	1,940	1,980	1,980	2,020	2,100
Employment, mine and plant, number	940	950	950	940	940
Net import reliance ⁴ 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 consists of revert, 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 reused. Recycling of molybdenum-bearing scrap will continue to be dependent on the markets for the principal alloy metals in which molybdenum is contained, such as iron, nickel, and chromium.

Import Sources (2018–21): Ferromolybdenum: Chile, 69%; Republic of Korea, 26%; and other, 5%. Molybdenum ores and concentrates: Peru, 60%; Mexico, 15%; Chile, 14%; and other, 11%. Total: Peru, 40%; Chile, 28%; Mexico, 10%; Canada, 9%; and other, 13%.

<u>Tariff:</u>	Item	Number	Normal Trade Relations <u>12–31–22</u>
	Molybdenum ore and concentrates, roasted	2613.10.0000	12.8¢/kg on molybdenum content + 1.8% ad valorem.
	Molybdenum ore and concentrates, other	2613.90.0000	17.8¢/kg on molybdenum content.
	Molybdenum chemicals:		
	Molybdenum oxides and hydroxides	2825.70.0000	3.2% ad valorem.
	Molybdates of ammonium	2841.70.1000	4.3% ad valorem.
	Molybdates, all others	2841.70.5000	3.7% ad valorem.
	Molybdenum pigments, molybdenum orange	3206.20.0020	3.7% ad valorem.
	Ferrolloys, ferromolybdenum	7202.70.0000	4.5% ad valorem.
	Molybdenum metals:		
	Powders	8102.10.0000	9.1¢/kg on molybdenum content + 1.2% ad valorem.
	Unwrought	8102.94.0000	13.9¢/kg on molybdenum content + 1.9% ad valorem.
	Wrought bars and rods	8102.95.3000	6.6% ad valorem.
	Wrought plates, sheets, strips, and so forth	8102.95.6000	6.6% ad valorem.
	Wire	8102.96.0000	4.4% ad valorem.
	Waste and scrap	8102.97.0000	Free.
	Other	8102.99.0000	3.7% ad valorem.

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

Government Stockpile: None.

Events, Trends, and Issues: In 2022, the estimated average molybdenic oxide price increased by 11% compared with that in 2021. Molybdenum prices have not reached this high of a level since 2008. Estimated U.S. imports for consumption increased by 8% compared with those in 2021. U.S. exports decreased by 12% from those in 2021. Estimated apparent consumption in 2022 increased by 96% compared with that in 2021.

Global molybdenum production in 2022 was essentially unchanged compared with that in 2021. In descending order of production, China, Chile, the United States, Peru, and Mexico provided 93% of total global production. Molybdenum producers in China continued to face difficulties owing to tightening of environmental regulations making it more difficult to obtain mining permits. Molybdenum prices in China reached decade-high levels as molybdenum-bearing steel consumption remained high. In Chile, molybdenum producers continued to struggle with persistently lower ore grades. However, molybdenum was expected to continue to make strong contributions in global power generation and infrastructure projects as countries begin to prioritize climate change.

World Mine Production and Reserves: Reserves for Canada, China, the Republic of Korea, Peru, and Uzbekistan were revised based on company and Government reports.

	Mine production		Reserves ⁵ (thousand metric tons)
	2021	2022 ^e	
United States	41,100	42,000	2,700
Argentina	—	—	100
Armenia	7,760	7,800	150
Canada	1,390	970	72
Chile	49,400	44,000	1,400
China	95,300	100,000	3,700
Iran	3,100	3,500	43
Korea, Republic of	408	400	8
Mexico	16,300	16,000	130
Mongolia	2,970	2,300	NA
Peru	34,100	32,000	2,400
Russia	^e 1,700	1,700	430
Turkey	—	—	360
Uzbekistan	<u>^e1,600</u>	<u>1,600</u>	<u>21</u>
World total (rounded)	255,000	250,000	12,000

World Resources:⁵ Identified resources of molybdenum in the United States are about 5.4 million tons, and in the rest of the world, about 20 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.

^eEstimated. E Net exporter. NA Not available. — Zero.

¹Reported consumption of primary molybdenum products.

²Defined as production + imports – exports ± adjustments for industry stock changes.

³Time-weighted average price per kilogram of molybdenum contained in technical-grade molybdenic oxide. Source: CRU Group.

⁴Defined as imports – exports ± adjustments for industry stock changes.

⁵See Appendix C for resource and reserve definitions and information concerning data sources.