

## MOLYBDENUM

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

**Domestic Production and Use:** In 2012, molybdenum, valued at about \$1.7 billion (based on an average oxide price), was produced at 12 mines. Molybdenum ore was produced as a primary product at four mines—one each in Colorado, Idaho, Nevada, and New Mexico—whereas eight copper mines (four in Arizona, one each in Montana, Nevada, New Mexico, and Utah) recovered molybdenum as a byproduct. Three roasting plants converted molybdenite concentrate to molybdic 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>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012<sup>e</sup></b>
Production, mine	55,900	47,800	59,400	63,700	57,000
Imports for consumption	14,500	11,400	19,700	21,100	21,000
Exports	34,700	27,900	31,600	35,400	34,000
Consumption:					
Reported <sup>1</sup>	21,100	17,700	19,200	19,300	18,000
Apparent <sup>2</sup>	36,400	30,500	46,500	48,300	45,000
Price, average value, dollars per kilogram <sup>3</sup>	62.99	25.84	34.93	34.13	29.20
Stocks, mine and plant concentrates, product, and consumer materials	7,000	7,700	8,800	9,800	8,800
Employment, mine and plant, number	940	920	940	940	940
Net import reliance <sup>4</sup> as a percentage of apparent consumption	E	E	E	E	E

**Recycling:** Molybdenum in the form of molybdenum metal or superalloys was recovered, but the amount was small. Although molybdenum is not recovered from scrap steel, recycling of steel alloys is significant, and some molybdenum content is reutilized. 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.

**Import Sources (2008–11):** Ferromolybdenum: Chile, 74%; Canada, 8%; United Kingdom, 6%; China, 3%; and other, 9%. Molybdenum ores and concentrates: Mexico, 32%; Chile, 24%; Peru, 24%; Canada, 16%; and other, 4%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Normal Trade Relations 12–31–12</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.
Ferrous alloys, 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.

## MOLYBDENUM

**Events, Trends, and Issues:** U.S. mine output of molybdenum in concentrate in 2012 decreased by 11% from that of 2011. U.S. imports for consumption slightly increased from those of 2011, while U.S. exports decreased by 4% from those of 2011. Domestic roasters operated close to full production levels in both 2011 and 2012. Reported U.S. consumption of primary molybdenum products decreased by 4% from that of 2011. Apparent consumption of roasted molybdenum concentrates decreased by 7% from that of 2011. Mine capacity utilization in 2011 was about 75%.

Molybdenum prices slowly increased in the first 2 months of 2012 but decreased for the remainder of the year; the average price for 2012 was lower than that of 2011. However, molybdenum demand remained strong. Both byproduct and primary molybdenum production levels in the United States remained stable in 2012 compared with their relatively low levels in 2009. Byproduct molybdenum production commenced at the Chino Mine in Grant County, NM, and the Morenci Mine in Greenlee County, AZ. Byproduct molybdenum production at the Mission Mine in Pima County, AZ, continued to be suspended.

**World Mine Production and Reserves:** Reserves for Armenia and Chile were revised based on new information from those countries.

	Mine production		Reserves <sup>5</sup> (thousand metric tons)
	2011	2012 <sup>e</sup>	
United States	63,700	57,000	2,700
Armenia	4,500	4,600	150
Canada	8,400	9,400	220
Chile	40,900	35,300	2,300
China	106,000	105,000	4,300
Iran	3,700	4,000	50
Kazakhstan	—	—	130
Kyrgyzstan	250	250	100
Mexico	10,900	10,900	130
Mongolia	1,960	1,950	160
Peru	19,100	19,500	450
Russia <sup>e</sup>	3,900	3,900	250
Uzbekistan <sup>e</sup>	550	550	60
World total (rounded)	264,000	250,000	11,000

**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 as an alloying element 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 the alloying properties of the metal. Potential substitutes for molybdenum include chromium, vanadium, niobium (columbium), and boron in alloy steels; tungsten in tool steels; graphite, tungsten, and tantalum for refractory materials in high-temperature electric furnaces; and chrome-orange, cadmium-red, and organic-orange pigments for molybdenum orange.

<sup>e</sup>Estimated. E Net exporter. —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 Ryan's Notes.

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

<sup>5</sup>See Appendix C for resource/reserve definitions and information concerning data sources.