

## MOLYBDENUM

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

**Domestic Production and Use:** In 2001, molybdenum, valued at about \$199 million (based on average oxide price), was produced by six mines. Molybdenum ore was produced at two mines, one in Colorado and one in Idaho, whereas four mines in Arizona, New Mexico, and Utah recovered molybdenum as a byproduct. Three plants converted molybdenite (MoS<sub>2</sub>) concentrate to molybdic oxide, from which intermediate products, such as ferromolybdenum, metal powder, and various chemicals, were produced. Iron and steel producers accounted for about 75% of the molybdenum consumed. End-use applications were as follows: machinery, 35%; electrical, 15%; transportation, 15%; chemicals, 10%; oil and gas industry, 10%; and other, 15%.

<b>Salient Statistics—United States:</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001<sup>e</sup></b>
Production, mine	60,100	53,300	42,400	41,100	38,300
Imports for consumption	13,200	14,400	13,800	14,400	14,600
Exports, all primary forms	62,100	41,700	27,900	21,900	32,300
Consumption:					
Reported	20,000	18,800	18,700	18,600	16,300
Apparent	23,000	21,100	32,500	34,200	22,300
Price, average value, dollars per kilogram <sup>1</sup>	9.46	5.90	5.90	5.64	5.20
Stocks, mine and plant concentrates, product, and consumer materials	11,300	16,200	12,000	11,400	9,700
Employment, mine and plant, number	700	600	475	390	290
Net import reliance <sup>2</sup> as a percentage of apparent consumption	E	E	E	E	E

**Recycling:** Secondary molybdenum in the form of molybdenum metal or superalloys was recovered, but the amount was small. About 1,000 metric tons of molybdenum was reclaimed from spent catalysts. Although molybdenum is not recovered from scrap steel, recycling of steel alloys is significant, and molybdenum content is reutilized. Data on the quantities of molybdenum recycled in this manner are not available.

**Import Sources (1997-2000):** China, 35%; United Kingdom, 21%; Chile, 20%; Canada, 12%; and other, 12%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Normal Trade Relations 12/31/01</b>
Molybdenum ore and concentrates, roasted	2613.10.0000	12.9¢/kg + 1.8% ad val.
Molybdenum ore and concentrates, other	2613.90.0000	18.2¢/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	10.1¢/kg + 1.3% ad val.
Unwrought	8102.91.1000	13.9¢/kg + 1.9% ad val.
Waste and scrap	8102.91.5000	Free.
Wrought	8102.92.3000	6.6% ad val.
Wire	8102.93.0000	4.8% ad val.
Other	8102.99.0000	4.1% ad val.

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

**Government Stockpile:** None.

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**Events, Trends, and Issues:** U.S. mine output of molybdenum in 2001 decreased an estimated 7% from that of 2000. U.S. imports for consumption were about the same as those of 2000, while the U.S. exports increased 47% over those of 2000. U.S. reported consumption of 2001 decreased 12% from that of 2000.

Prices of concentrates and molybdenum products moderated toward the end of the year. The domestic price for technical-grade molybdic oxide averaged \$5.20 per kilogram of contained molybdenum during 2001. Mine capacity utilization was about 40%.

### World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves <sup>3</sup> (thousand metric tons)	Reserve base <sup>3</sup>
	2000	2001 <sup>e</sup>		
United States	41,100	38,300	2,700	5,400
Armenia	2,700	2,700	20	30
Canada	6,830	6,800	450	910
Chile	29,100	35,000	1,100	2,500
China	28,900	28,900	500	1,000
Iran	1,600	1,600	50	140
Kazakhstan	600	600	130	200
Kyrgyzstan	250	300	100	180
Mexico	6,890	6,900	90	230
Mongolia	1,340	1,400	30	50
Peru	7,190	7,200	140	230
Russia <sup>e</sup>	2,400	2,400	240	360
Uzbekistan <sup>e</sup>	350	400	60	150
World total (rounded)	129,000	133,000	5,600	11,000

**World Resources:** Identified resources amount to about 5.5 million metric tons of molybdenum in the United States and about 12 million metric tons in the world. 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 the metal, industry has sought to develop new materials that benefit from the alloying properties of molybdenum. Potential substitutes for molybdenum include chromium, vanadium, columbium (niobium), 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.

<sup>1</sup>Major producer price per kilogram of molybdenum contained in technical-grade molybdic oxide.

<sup>2</sup>Defined as imports - exports + adjustments for Government and industry stock changes.

<sup>3</sup>See Appendix C for definitions.