

## MOLYBDENUM

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

**Domestic Production and Use:** In 1998, molybdenum, valued at about \$454 million (based on average oxide price), was produced by 11 mines. Molybdenum ore was produced at 3 mines in Colorado, New Mexico, and Idaho, whereas 8 mines in Arizona, Montana, 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. Major end-use applications were as follows: machinery, 35%; electrical, 15%; transportation, 15%; chemicals, 10%; oil and gas industry, 10%; and others, 15%.

<b>Salient Statistics—United States:</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998<sup>e</sup></b>
Production, mine	46,800	60,900	54,900	60,900	53,500
Imports for consumption	7,153	11,500	13,400	15,000	15,200
Exports, all primary forms	37,000	51,300	49,600	50,400	45,000
Consumption: Reported	19,100	19,900	20,900	20,000	20,000
Apparent	25,400	20,200	21,200	23,000	23,600
Price, average value, dollars per kilogram <sup>1</sup>	4.60	17.50	8.30	9.46	8.50
Stocks, mine and plant concentrates, product, and consumer materials	11,500	12,400	9,930	11,400	12,500
Employment, mine and plant, number	700	700	800	700	600
Net import reliance <sup>2</sup> as a percent 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 tons of molybdenum was reclaimed from spent catalysts. While 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 (1994-97):** United Kingdom, 30%; Chile, 22%; China, 17%; Canada, 14%; and other, 17%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Normal Trade Relations (NTR) 12/31/98</b>	<b>Non-NTR<sup>3</sup> 12/31/98</b>
Molybdenum ore and concentrates, roasted	2613.10.0000	13¢/kg + 1.8% ad val.	\$1.10/kg + 15% ad val.
Molybdenum ore and concentrates, other	2613.90.0000	18.2¢/kg	77.2¢/kg.
Molybdenum chemicals:			
Molybdenum oxides and hydroxides	2825.70.0000	3.2% ad val.	20.5% ad val.
Molybdates of ammonium	2841.70.1000	4.3% ad val.	29% ad val.
Molybdates, all others	2841.70.5000	3.7% ad val.	25% ad val.
Molybdenum pigments:			
Molybdenum orange	3206.20.0020	3.7% ad val.	25% ad val.
Miscellaneous chemical products:			
Mix of two or more inorganic compounds of molybdenum	3824.90.3400	2.8% ad val.	18% ad val.
Ferroalloys:			
Ferromolybdenum	7202.70.0000	4.5% ad val.	31.5% ad val.
Molybdenum metals:			
Powders	8102.10.0000	10.1¢/kg + 1.3% ad val.	\$1.10/kg + 15% ad val.
Unwrought	8102.91.1000	13.9¢/kg + 1.9% ad val.	\$1.10/kg + 15% ad val.
Waste and scrap	8102.91.5000	Free	Free.
Wrought	8102.92.3000	6.6% ad val.	60% ad val.
Wire	8102.93.0000	4.8% ad val.	60% ad val.
Other	8102.99.0000	4.1% ad val.	45% ad val.

## MOLYBDENUM

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

**Government Stockpile:** None.

**Events, Trends, and Issues:** U.S. mine output of molybdenum in 1998 decreased to about the level of 1996, after rising nearly 11% in 1997. The decline reflected reduced prices. Reported consumption of molybdenum was about the same as in 1997, while exports decreased about 11%, and U.S. producer inventories increased about 10% above those of 1997.

The molybdenum industry was uneventful in 1998, and prices of concentrates and molybdenum products moderated toward the end of the year. The domestic price for technical-grade molybdic oxide averaged \$8.50 per kilogram of contained molybdenum during 1998, a decline of 10% from that of 1997. Mine capacity utilization was 43%.

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

	Mine production		Reserves <sup>4</sup> (thousand metric tons)	Reserve base <sup>4</sup> (thousand metric tons)
	1997	1998 <sup>e</sup>		
United States	60,900	53,500	2,700	5,400
Armenia	1,800	2,000	20	30
Canada	7,540	8,000	450	910
Chile	17,900	18,900	1,100	2,500
China	32,000	33,000	500	1,000
Iran	600	1,000	50	140
Kazakhstan	400	500	130	200
Mexico	4,300	4,000	90	230
Mongolia	1,992	2,000	30	50
Peru	3,835	4,000	140	230
Russia	8,500	8,500	240	360
Uzbekistan	500	500	60	150
Other countries	—	—	—	590
World total (rounded)	140,000	136,000	5,500	12,000

**World Resources:** Identified resources amount to about 5.5 million metric tons of molybdenum in the United States and more than 12 million metric tons in the world. Molybdenum occurs both as the principal metal sulfide in large low-grade porphyry molybdenum deposits and as a subsidiary 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, 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 B.

<sup>4</sup>See Appendix D for definitions.