

## MOLYBDENUM

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

**Domestic Production and Use:** In 1997, molybdenum, valued at about \$456 million (based on average oxide price), was produced by 14 mines. Molybdenum ore was produced at three mines in Colorado, New Mexico, and Idaho, whereas nine 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 ferro-molybdenum, 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>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997<sup>e</sup></b>
Production, mine	36,800	46,800	60,900	54,900	55,500
Imports for consumption	3,400	2,280	5,570	5,480	5,500
Exports, all primary forms	30,600	37,000	51,300	49,600	50,000
Consumption: Reported	17,700	18,800	19,900	20,300	20,000
Apparent	11,600	20,480	14,270	12,300	11,700
Price, average value, dollars per kilogram <sup>1</sup>	5.13	4.60	17.50	8.30	8.50
Stocks, mine and plant concentrates, product, and end-use	19,900	11,500	12,400	10,800	10,100
Employment, mine and plant, number	680	700	700	800	700
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. Although some molybdenum was recycled as a minor constituent of scrap alloy steels and iron, the use of such scrap did not generally depend on its molybdenum content.

**Import Sources (1993-96):** The United Kingdom, 30%; Chile, 20%; China, 18%; Canada, 13%; and other, 19%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Most favored nation (MFN) 12/31/97</b>	<b>Non-MFN<sup>3</sup> 12/31/97</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	18.6¢/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	11¢/kg + 1.6% 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	8102.92.0000	6.6% ad val.	60% ad val.
Wire	8102.93.0000	5.3% ad val.	60% ad val.
Other	8102.99.0000	4.4% ad val.	45% ad val.

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

**Government Stockpile:** None.

**Events, Trends, and Issues:** After startup in late 1996, the Questa molybdenum mine, Questa, NM, operated during the entire year of 1997. U.S. mine output of molybdenum in 1997 increased slightly compared with that of 1996. Reported consumption of molybdenum also was about the same; exports were about the same, and U.S. producer inventories were about the same as those of 1996.

The molybdenum industry was uneventful in 1997 and prices of concentrates and molybdenum products moderated toward the end of year. The domestic price for technical-grade molybdic oxide averaged \$8.50 per kilogram of contained molybdenum during 1997. Mine capacity utilization was 50%.

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

	Mine production		Reserves <sup>4</sup>	Reserve base <sup>4</sup>
	1996	1997 <sup>e</sup>		
United States	54,900	55,500	2,700	5,400
Armenia	900	900	20	30
Canada	8,850	9,000	450	910
Chile	18,000	20,000	1,100	2,500
China	25,000	25,000	500	1,000
Iran	1,200	1,200	50	140
Kazakstan	800	800	130	200
Mexico	3,900	4,000	90	230
Mongolia	2,200	2,200	30	50
Peru	3,710	3,800	140	230
Russia	8,500	8,500	240	360
Uzbekistan	500	500	60	150
Other countries	—	—	—	590
World total (rounded)	128,000	131,000	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.