



2006 Minerals Yearbook

MOLYBDENUM

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Molybdenum is a refractory metallic element used principally as an alloying agent in cast iron, steel, and superalloys to enhance hardenability, strength, toughness, and wear- and corrosion- resistance. To achieve desired metallurgical properties, molybdenum, primarily in the form of molybdic oxide (MoX) or ferromolybdenum (FeMo), is frequently used in combination with or added to chromium, manganese, nickel, niobium (columbium), tungsten, or other alloy metals. The versatility of molybdenum in enhancing a variety of alloy properties has ensured it a significant role in contemporary industrial technology, which increasingly requires materials that are serviceable under high stress, expanded temperature ranges, and highly corrosive environments. Moreover, molybdenum finds significant use as a refractory metal in numerous chemical applications, including catalysts, lubricants, and pigments. The variety of uses for molybdenum materials, few of which afford acceptable substitution, has resulted in an increase in Western molybdenum consumption to an estimated 165,000 metric tons per year (t/yr) [364 million pounds per year (Mlb/yr)] in 2006 from about 68,000 t/yr (150 Mlb/yr) in 1983 (Adams, 2004; 2007).

The U.S. molybdenum reserve base was estimated to be about 5.4 Mt, about 28% of the world molybdenum reserve base. About 90% of U.S. reserves occur in large low-grade porphyry molybdenum deposits mined or anticipated to be mined primarily for molybdenum and as an associated metal sulfide in low-grade porphyry copper deposits. These deposits are located in Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, and Utah. Other molybdenum sources contribute insignificantly to U.S. reserves.

Production

Domestic production data for molybdenum were derived from three separate voluntary surveys by the U.S. Geological Survey. These surveys are “Molybdenum Ore and Concentrate” (annual), “Molybdenum Concentrate” (monthly), and “Molybdenum Products and Molybdenum Concentrates” (monthly). Surveys were sent to all eight U.S. operations that produce molybdenum concentrates and products from ore, and all responded, representing 100% of the U.S. production listed in table 1.

In 2006, U.S. mine production of molybdenum concentrate was 59,800 t, about a 3% increase from the 58,000 t produced in 2005. World mine production of molybdenum in 2006 was about 185,000 t, slightly less than production in 2005. The U.S. share of world production was about 32% in 2006. Net U.S. production of molybdenum products increased to 30,600 t in 2006 from 29,800 t in 2005 (table 2).

As of December 31, 2006, U.S.-rated capacity for mines and mills was estimated to be about 75,000 t/yr of contained

metal. Rated capacity was defined as the maximum quantity of product that could be produced in a period of time at a normally sustainable long-term operating rate based on the physical equipment of the plant and given acceptable routine operating procedures involving energy, labor, maintenance, and materials. Capacity included operating plants temporarily closed that, in the judgment of the author, could be brought into production within a short period of time with minimal capital expenditure.

Primary molybdenum production continued at the Henderson Mine in Colorado, the Questa Mine in New Mexico, and the Thompson Creek Mine in Idaho. The Climax Mine in Colorado has been inactive since 1995. Molybdenum was produced as a byproduct of copper production at the Bagdad and the Sierrita Mines in Arizona, the Continental Pit in Montana, the Robinson Mine in Nevada, the Chino Mine in New Mexico, and the Bingham Canyon Mine in Utah (table 10).

In the case of byproduct molybdenum recovery at a copper mine, all mining costs associated with producing the molybdenum concentrate are allocated to the primary metal (copper). Owing to this cost advantage, byproduct molybdenite recovery at selected porphyry copper mines was estimated to account for 57% of the United States molybdenum supply and 61% of the worldwide molybdenum supply in 2006. Kennecott Utah Copper increased byproduct molybdenum production by more than 7%, and Montana Resources increased production by about 5% compared with that of 2005. Quadra Mining Ltd. restarted the molybdenum recovery circuit at the Robinson Mine in 2006.

Primary molybdenum mines operate in a swing capacity (filling the market gap between byproduct production and demand) and have a limited ability to change their production rate to meet spikes in demand. Phelps Dodge Corp. increased primary molybdenum recovery by about 11% through development work at its Henderson Mine, while production at the Thompson Creek Mine decreased by about 15% in 2006 owing to lower ore grades. The Questa Mine continued to operate its mine and mill separately at intervals of about 2 to 3 months. Phelps Dodge continued to conduct a feasibility study on reopening its Climax Mine by yearend 2009. If reopened, the mine could produce 9,000 to 13,600 t/yr (20 to 30 Mlb/yr) (Ryan’s Notes, 2006d).

In November 2006, Asarco LLC announced that it would restart the molybdenum circuit at its Mission complex in Sahuarita, AZ (the Mission molybdenum circuit was last operated in 1996.) The first commercial-grade concentrate was bagged and ready for shipment in January 2007. Asarco expected to produce 200 t (450,000 pounds) of molybdenum in concentrate in 2007 (Metal-Pages, Ltd., Ltd., 2007b).

In December 2006, Golden Phoenix Minerals, Inc. began operation of the 90-metric-ton-per-day (t/d) flotation mill using

stockpiled ore to adjust ore grind and reagent chemistry. The mill operated for about 6 hours and produced 680 kilograms (1,500 pounds) of concentrate. The company concluded a sales arrangement with Derek Raphael for all concentrate produced at the mine (Golden Phoenix Minerals Inc., 2007). Golden Phoenix began the next phase of development to increase mine output from 27 t/d to 90 t/d mill design capacity (Ryan's Notes, 2007).

Consumption

In 2006, reported U.S. consumption of molybdenum concentrate for roasting was 44,400 t, a decrease of about 2,200 t compared with that of 2005. The decrease resulted from reduced mine production owing to lower ore grades. Domestic mine production of molybdenum concentrate was roasted, exported for conversion, or purified to lubricant-grade molybdenum disulfide (MoS₂). Technical-grade MoX consumption in 2006 was about 1% more than that of 2005. Oxide was the leading form of molybdenum used by industry, particularly in making full alloy, stainless and tool steel, and superalloys; however, some of the oxide was converted to other molybdenum products, such as ammonium and sodium molybdates, FeMo, high-purity oxide, and metal powder (table 3).

Metallurgical applications continued to dominate molybdenum use in 2006, accounting for about 83% of total consumption (table 3). In 2006, ferromolybdenum again accounted for about 41% of the molybdenum-bearing materials used to make steel, which was the same percentage as that of 2005. Nonmetallurgical applications included catalysts, chemicals, lubricants, and pigments. The dominant nonmetallurgical use was in catalysts.

Stocks

At yearend 2006, producer plus consumer industry stocks contained about 5,260 t of molybdenum, a decrease of about 540 t compared with the stock level at yearend 2005. Inventories of molybdenum in concentrate at mines and plants decreased by about 1,500 t. Producer stocks of molybdenum in such products as FeMo, molybdates, MoX, metal powders, and other types decreased by about 560 t compared with those of 2005. Total stocks of about 7,380 t represented about a 21-week supply. Supply was calculated as reported stocks divided by annual consumption (table 1).

Prices

Prices were reported in Platts Metals Week in dollars per kilogram (kg) of contained molybdenum. The annual time-average prices for 2006 were MoX, \$54.618 per kg and FeMo, \$58.942 per kg of contained molybdenum, which represented decreases of about 23% and 28%, respectively, compared with 2005 prices. Molybdenum prices were level from January through April, but rose steadily from May through September when they reached their highest point at \$62.611 for MoX and \$63.934 for FeMo. Prices followed a generally downward trend the rest of the year to close at \$54.454 and \$58.422, respectively. The MoX monthly average price ranged from a low of \$49.356

per kg in January to a high of \$60.765 per kg in September, and the FeMo monthly average price ranged from a low of \$55.529 per kg in January to a high of \$62.832 per kg in September.

Foreign Trade

In 2006, molybdenum-containing material exports collectively contained about 39,200 t of molybdenum and were valued at \$1.99 billion (table 6). Imports for consumption of molybdenum-containing products collectively contained about 15,800 t of molybdenum and were valued at \$701 million (table 9).

World Review

World molybdenum reserves and production capacity were concentrated in a few countries. World mine output was estimated to be 185,000 metric tons (t) (molybdenum contained in concentrate), of which, in descending order of production, the United States, China, Chile, Peru, and Canada provided about 93% (table 11). Chile, China, and the United States also held about 85% of the estimated 19 million metric tons (Mt) of molybdenum in the world reserve base.

In North America, most Canadian reserves of molybdenum were contained in porphyry molybdenum and porphyry copper-molybdenum deposits in British Columbia. Other Canadian reserves were associated with minor copper-molybdenum porphyry deposits in New Brunswick and Quebec. The La Caridad porphyry copper-molybdenum deposit in Mexico also was a leading producer. Molybdenum reserves in Central America and South America were associated mainly with large copper porphyry deposits. Of several such deposits in Chile, the Chuquicamata and El Teniente deposits were among the world's largest and accounted for 85% of molybdenum reserves in Chile. Peru also had substantial reserves. Numerous other porphyry copper deposits that may contain recoverable quantities of molybdenum have been identified in Central America and South America. Many of these deposits were being actively explored and evaluated and could substantially add to reserves in the future. Reserves of molybdenum in China and the Commonwealth of Independent States were thought to be substantial, but definitive information about the current sources of supply or prospects for future development in these two areas was lacking.

European Union.—In October, the European Union (EU) agreed to a 9-month suspension of the 22.5% antidumping duty on imports of ferromolybdenum from China (Metal-Pages, Ltd., Ltd., 2006b). The European Confederation of Iron and Steel Industries petitioned the EU in June 2005, asking it to either conduct an interim review of the antidumping tariff on Chinese origin FeMo imports or temporarily suspend the duty. A duty of 22.5% was placed on Chinese-origin FeMo by the European Commission in January 2002 after a finding that dumping of Chinese material had caused harm to the European FeMo industry (Ryan's Notes, 2005).

Armenia.—Germany's Cronimet Mining GmbH managed Zangezur Copper-Molybdenum CJSC, which operated the Karajan copper-molybdenum mine (the largest molybdenum-bearing deposit in the former Soviet Union.) All molybdenum

concentrates produced by the Zangezur plant were processed in Armenia, primarily by Armenian Pure Iron Works (API). API produced about 2,600 t of FeMo, 13% less than that of 2005, but increased production of molybdenum metal to 490 t, about 85% more than that of 2005. Cronimet, which owned 60% of Zangezur and 51% of API, handled the sales of the plant's finished molybdenum products to European customers (Metal-Pages Ltd., 2007a).

Canada.—Roca Mines Inc. planned to be the first new primary molybdenum producer in Canada, with production planned to commence in 2007 at its Max Molybdenum Mine, Trout Lake, British Columbia. The first phase of the mine plan was permitted at 500 t/d and was to focus on a high-grade zone with 280,000 t of measured and indicated reserves grading 1.95% MoS₂. Roca also completed a private stock placement that netted \$7 million to accelerate construction of a second mill circuit and expand underground mine production (Metal-Pages, Ltd., 2006c).

Blue Pearl Mining Ltd. announced the acquisition of Thompson Creek Metals Company in October 2006. Assets acquired included 100% of the Thompson Creek Mine and mill in Idaho and the Langeloth roaster and metallurgical refinery in Pennsylvania, and a 75% interest in the Endako Mine, mill, and roaster in British Columbia. Prior to the acquisition, Blue Pearl's only asset was the Davidson Mine, an underground molybdenum deposit located about 200 kilometers northwest of the Endako complex (Metal-Pages Ltd., 2006a).

Chile.—Molybdenum production by Corporacion Nacional del Cobre (Codelco) in Chile was expected to decrease to about 31,000 t [68 million pounds (Mlb)] in 2006 compared with about 37,000 t (81 Mlb) in 2005. Production was reduced owing to a combination of lower ore grades and a broken conveyor belt at the Chuquicamata Mine. In addition, a mill at the Collahuasi Mine that broke down in 2006, and was repaired temporarily, was to be shut down for 3 months starting January 2007 for permanent repairs. Mill production would be reduced by about 450 t (1 Mlb) in 2007 owing to the shutdown. The Collahuasi Mine produced about 5,400 t of molybdenum (12 Mlb) in 2006 (Ryan's Notes, 2006b).

Molibdenos y Metales SA (Molymet) announced plans to build a new molybdenum roasting plant in Chile's Region 2 near Mejillones. The project would provide an additional 13,600 t (30 Mlb) of molybdenum concentrate roasting capacity starting in 2010. This facility would be in addition to Molymet's previously announced expansions of 18,150 t (40 Mlb) to the existing plant at Nos, Chile, in 2007 and 4,500 t (10 Mlb) to the existing plant at Sadaci, Belgium, in 2009. The decision to build the new plant was based on forecasts that additional roasting capacity would be needed around 2010 (Metal Bulletin, 2006c).

Amerigo Resources MVC produced 11,200 t (24.67 Mlb) of copper and 305 t (674,549 pounds) of molybdenum in 2006 compared with 13,500 t (29.88 Mlb) of copper and 285 t (631,843 pounds) of molybdenum in 2005. In 2005, Amerigo acquired the extraction rights to mineral values in the fresh tailings from the El Teniente Mine and to the existing 200 Mt of tailings in the Colihues tailings impoundment. Amerigo reprocessed the tailings at its facility south of Santiago, Chile. Flow to the facility was interrupted for about 4 months in the

2nd and 3rd quarters as Codelco completed repairs to the bridge that carried the pipeline (Metal-Pages, Ltd., 2007c).

China.—The molybdenum market continued to be tight owing to the ongoing production problems at Codelco's Chuquicamata Mine in Chile (collapsed conveyor belt) and the strike at Grupo Mexico S.A. de C.V.'s La Caridad Mine in Mexico. The world supply deficit could be partially offset by renewed production from the Huludao Region in China. Mines in the Huludao Region of Liaoning Province had been closed for more than a year owing to environmental and health and safety concerns. According to a representative from Shangxiang Minmetals Inc., many of the mines were consolidated into the newly-formed Huludao Lianshan Molybdenum Industry Co., which began production in September. Production was expected to reach about 2,250 t (5 Mlb) of molybdenum in 2006 and could reach 9,000 t (20 Mlb) in 2007 (Ryan's Notes, 2006e).

According to Chinese Government statistics, molybdenum concentrate production by state-authorized mines rose by more than 40% to 67,098 t through September compared with that of the same period in 2005. The gradual restart of the closed mines in the Huludao Region increased the output in Liaoning Province by 33% to 3,750 t. Production from Shaanxi Province fell by 2% to 22,661 t, while production in Henan Province rose by 122% to 29,137 t. Domestic prices for Chinese FeMo began to decrease after the imposition of the 10% export duty on November 1. What long-term effect the export duty would have on Chinese molybdenum exports was unknown; however, if Chinese domestic prices were to fall to more than 10% below world prices, it would reportedly be profitable for companies to export FeMo and pay the duty (Ryan's Notes, 2006a).

Kazakhstan.—Kazakhstan's state-owned National Atomic Company, Kazatomprom, announced its intention to enter the global molybdenum market. Kazatomprom formed an alliance, called Molyken, with Eureka Mining Plc. (United Kingdom), which developed the Shorskoe molybdenum deposit in Kazakhstan. In June 2006, Kazatomprom began production of 130 to 140 metric tons per month of molybdenum concentrate for export mostly to Russia and China. Kazatomprom stated that it would invest more than \$180 million within 2 years to develop a refinery capable of producing technical-grade molybdenum oxide and ferromolybdenum (Metal Bulletin, 2006b).

Outlook

In November, Freeport McMoran Copper & Gold Inc. agreed to acquire Phelps Dodge for about \$25.9 billion in cash and stock. The combined companies would have an annual production of 1.68 Mt (3.7 billion pounds) of copper, 1.8 million troy ounces of gold, and 31,300 t (69 Mlb) of molybdenum. Molybdenum production was forecast to increase to 34,000 t (75 Mlb) in 2007 and to 36,300 t (80 Mlb) in 2008 and 2009, before increasing to 38,500 t (85 Mlb) in 2010. The merger was recommended by the Boards of Directors of both companies and was to be presented for shareholder approval in the first quarter of 2007 (Metal Bulletin, 2006a). A Phelps Dodge representative stated that the world molybdenum market was expected to be nearly in balance in 2006 and that molybdenum inventories likely would remain below normal (Ryan's Notes, 2006c).

A Jinduicheng Molybdenum Group Co. Ltd. (JDC) representative estimated that Chinese molybdenum consumption in 2006 would be about 20% higher than the 19,800 t consumed in 2005. Continued growth in molybdenum consumption in the steel industry, particularly in the manufacture of steel pipelines for domestic consumption, was given as the driving force. JDC, China's leading molybdenum producer, forecast a 2006 production of about 10,900 t (24 Mlb) of molybdenum, about the same level with 2005 production (Platts Metals Week, 2006).

Because of abundant resources and adequate production capacity in Chile, China, the United States, and other countries, world producers expected to be able to meet the future requirements for molybdenum readily. The principal use for molybdenum was expected to continue to be in chemicals and catalysts and as an additive in steel manufacturing in general, most importantly alloy and stainless steel.

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TABLE 1
SALIENT MOLYBDENUM STATISTICS¹

(Metric tons of contained molybdenum)

	2002	2003	2004	2005	2006
United States:					
Concentrate:					
Production	32,300	33,500	41,500	58,000	59,800
Shipments	32,300	33,600	42,000	57,900	59,900
Reported consumption ²	21,200	27,500	38,700	46,600	44,400
Imports for consumption	4,710	5,190	8,780	11,900	10,900
Stocks, December 31:					
Concentrate, mine and plant	3,870	2,520	2,610	3,620 ^f	2,120
Product producers ³	4,300	2,760	2,840	3,770	3,210
Consumers	1,800	1,900	2,040	2,030	2,050
Total	9,970	7,180	7,480	9,420 ^f	7,380
Primary products:					
Production	31,300	41,400	66,300	78,500	78,000
Shipments	27,500	30,100	39,300	46,700	51,000
Reported consumption	15,300	16,400	17,400	18,900	19,100
World, mine production	122,000	131,000	159,000	186,000 ^f	185,000 ^e

^eEstimated. ^fRevised.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Molybdenum concentrates roasted to make molybdenum oxide.

³Includes ammonium, calcium, and sodium molybdate; briquets; ferromolybdenum; molybdenum hexacarbonyl; molybdenum metal; molybdenum pentachloride; molybdic acid; pellets; phosphomolybdic disulfide; and technical and purified molybdic oxide.

TABLE 2
PRODUCTION, SHIPMENTS, AND STOCKS OF MOLYBDENUM PRODUCTS IN THE UNITED STATES¹

(Metric tons of contained Mo)

	Metal powder		Other ²		Total	
	2005	2006	2005	2006	2005	2006
Received from other producers	--	--	17,900	19,800	17,900	19,800
Gross production during year	4,700	5,170	73,800	72,800	78,500	78,000
Molybdenum products used to make other products	3,660	3,550	45,100	43,800	48,700	47,400
Net production	1,050	1,620	28,700	29,000	29,800	30,600
Shipments	1,050	1,490	45,700	49,500	46,700	51,000
Producer stocks, December 31	171	296	3,600	2,910	3,770	3,210

-- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes ammonium, calcium, and sodium molybdate; ferromolybdenum; molybdenum disulfide; molybdenum hexacarbonyl; molybdenum metal; molybdenum pentachloride; molybdic acid; molybdic oxides; pellets; and phosphomolybdic acid.

TABLE 3
U.S. REPORTED CONSUMPTION, BY END USES, AND CONSUMER STOCKS OF MOLYBDENUM MATERIALS¹

(Kilograms of contained Mo)

End use	Molybdic oxides	Ferromolybdenum ²	Ammonium and sodium molybdate	Molybdenum scrap	Other	Total
2005:						
Steel:						
Carbon	350,000	333,000	--	--	W	683,000
High-strength low-alloy	386,000	185,000	--	--	W	571,000
Stainless and heat-resisting	1,930,000	766,000	--	33,700	78,100	2,800,000
Full alloy	1,990,000	2,590,000	--	--	18,100	4,600,000
Tool	722,000	W	--	442	--	723,000
Total	5,380,000	3,870,000	--	34,200	96,300	9,380,000
Cast irons (gray, malleable, ductile iron)	W	736,000	--	--	51,500	788,000
Superalloys	1,120,000	22,800	--	(3)	1,680,000	2,820,000
Alloys (other than steels, cast irons, superalloys):						
Welding materials (structural and hard-facing)	--	44,800	--	--	733	45,500
Other alloys	W	51,400	--	913	1,950	54,300
Mill products made from metal powder ⁴	W	--	W	--	1,750,000	1,750,000
Cemented carbides and related products ⁵	--	--	--	--	95	95
Chemical and ceramic uses:						
Pigments	W	--	178,000	--	--	178,000
Catalysts	1,010,000	--	W	--	179,000	1,190,000
Other	--	--	--	--	12,300	12,300
Miscellaneous and unspecified uses:						
Lubricants	--	--	--	--	279,000	279,000
Other	1,120,000	91,500	975,000	--	191,000	2,380,000
Grand total	8,630,000	4,820,000	1,150,000	35,100	4,240,000	18,900,000
Stocks, December 31	512,000	604,000	14,200	36,100	866,000	2,030,000
2006:						
Steel:						
Carbon	255,000	384,000	--	--	W	639,000
High-strength low-alloy	533,000	154,000	--	--	W	687,000
Stainless and heat-resisting	2,080,000	776,000	--	33,700	78,100	2,970,000
Full alloy	2,020,000	2,570,000	--	--	18,100	4,610,000
Tool	628,000	W	--	442	--	629,000
Total	5,520,000	3,880,000	--	34,200	96,300	9,530,000
Cast irons (gray, malleable, ductile iron)	W	194,000	--	--	51,500	246,000
Superalloys	1,050,000	32,800	--	(3)	1,770,000	2,850,000
Alloys (other than steels, cast irons, superalloys):						
Welding materials (structural and hard-facing)	--	47,300	--	--	733	48,100
Other alloys	W	39,800	--	834	1,870	42,500
Mill products made from metal powder ⁴	W	--	W	--	2,250,000	2,250,000
Cemented carbides and related products ⁵	--	--	--	--	80	80
Chemical and ceramic uses:						
Pigments	W	--	110,000	--	--	110,000
Catalysts	1,010,000	--	W	--	179,000	1,190,000
Other	--	--	--	--	191,000	191,000
Miscellaneous and unspecified uses:						
Lubricants	--	--	--	--	279,000	279,000
Other	1,160,000	93,100	975,000	--	191,000	2,410,000
Grand total	8,730,000	4,290,000	1,080,000	35,000	5,010,000	19,100,000
Stocks, December 31	530,000	604,000	14,200	25,100	878,000	2,050,000

W Withheld to avoid disclosing company proprietary data; included with "Other" of the "Miscellaneous and unspecified uses" category. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes calcium molybdate.

³Included with "Superalloys, other alloys."

⁴Includes ingot, wire, rod, and sheet.

⁵Includes construction, mining, oil and gas, and metal working machinery.

TABLE 4
U.S. EXPORTS OF MOLYBDENUM PRODUCTS, BY PRODUCT AND COUNTRY¹

Product and country	HTS ² code	2005		2006	
		Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Oxides and hydroxides, gross weight:	2825.70.0000				
Austria		1,850	\$58,800	2,460	\$74,000
Canada		3,380	34,700	2,940	32,300
Finland		404	15,700	718	23,700
Germany		662	20,700	523	16,300
Japan		1,130	32,700	635	17,600
Mexico		13	207	81	1,720
Netherlands		2,600	94,400	838	27,200
United Kingdom		2,700	61,000	1,110	36,800
Other		1,830 ^r	56,300 ^r	2,300	70,600
Total		14,600	375,000	11,600	300,000
Molybdates all, gross weight:	2841.70.0000				
Canada		499	11,400	462	7,010
Japan		146	2,830	414	13,700
Mexico		424	8,410	221	5,770
Netherlands		843	28,400	779	22,400
Other		240 ^r	3,490 ^r	156	2,890
Total		2,150	54,500	2,030	51,800
Ferromolybdenum, contained weight: ³	7202.70.0000				
Canada		1,930	38,500	1,760	35,200
Mexico		89	1,310	143	2,450
Netherlands		33	2,450	14	688
Other		34	1,140	91	4,170
Total		2,090	43,400	2,010	42,500
Molybdenum other, gross weight: ⁴	Various ⁵				
Brazil		92	6,840	89	6,560
Canada		127	4,690	105	4,560
France		56	5,110	27	2,730
Germany		155	13,200	252	17,600
Hungary		59	4,290	70	6,140
India		23	2,180	32	2,900
Italy		15	1,510	2	218
Japan		528	49,000	552	54,100
Korea, Republic of		26	2,970	84	7,080
Mexico		18	1,800	7	835
Netherlands		25	2,250	8	270
Spain		12	1,050	5	399
Taiwan		309	7,760	168	7,780
United Kingdom		399	25,100	415	17,600
Other		184 ^r	11,700 ^r	189	14,400
Total		2,030	139,000	2,010	143,000

^rRevised.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Harmonized Tariff Schedule of the United States.

³Ferromolybdenum contains about 60% to 65% molybdenum.

⁴Includes powder, unwrought, waste and scrap, wire, wrought, and other.

⁵Includes HTS codes 8102.10.0000, 8102.94.0000, 8102.95.0000, 8102.96.0000, 8102.97.0000, and 8102.99.0000.

Source: U.S. Census Bureau.

TABLE 5
U.S. EXPORTS OF MOLYBDENUM ORE AND CONCENTRATES
(INCLUDING ROASTED AND OTHER CONCENTRATES), BY COUNTRY¹

Country	2005		2006	
	Quantity (metric tons of contained Mo)	Value (thousands)	Quantity (metric tons of contained Mo)	Value (thousands)
Australia	110	\$1,740	89	\$4,810
Belgium	9,430	377,000	7,490	327,000
Brazil	67	1,180	113	3,960
Canada	3,840	80,700	2,680	91,300
Chile	177	5,610	259	12,900
China	4,390	164,000	405	19,600
Finland	12	801	--	--
Germany	136	2,310	1	40
India	41	796	83	4,100
Japan	2,050	60,200	2,260	94,500
Korea, Republic of	12	269	45	2,500
Mexico	3,130	34,300	6,070	112,000
Netherlands	15,000	478,000	10,300	527,000
Spain	5	136	3	91
Sweden	--	--	20	686
Taiwan	4	75	53	2,830
United Kingdom	7,310	224,000	7,280	252,000
Other	656 ^r	16,100 ^r	54	2,110
Total	46,400	1,450,000	37,200	1,460,000

^rRevised. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 6
U.S. EXPORTS OF MOLYBDENUM PRODUCTS¹

Item	HTS ² code	2005			2006		
		Gross weight (metric tons)	Contained Mo (metric tons)	Value (thousands)	Gross weight (metric tons)	Contained Mo (metric tons)	Value (thousands)
Molybdenum ore and concentrates, roasted	2613.10.0000	NA	26,100	\$739,000	NA	18,200	\$770,000
Molybdenum ore and concentrates, other	2613.90.0000	NA	20,300	708,000	NA	19,000	687,000
Molybdenum chemicals:							
Oxides and hydroxides	2825.70.0000	14,600	NA	375,000	11,600	NA	300,000
Molybdates, all	2841.70.0000	2,150	NA	54,500	2,030	NA	51,800
Ferromolybdenum	7202.70.0000	3,480	2,090	43,400	3,280	2,010	42,500
Molybdenum powders	8102.10.0000	612	NA	40,700	688	NA	40,700
Molybdenum unwrought, bars and rods	8102.94.0000	71	NA	4,260	48	NA	2,420
Molybdenum waste and scrap	8102.97.0000	434	NA	16,700	525	NA	15,500
Molybdenum wire	8102.96.0000	218	NA	19,600	154	NA	14,900
Molybdenum, other	Various ³	693	NA	58,100	590	NA	69,700
Total		22,200	48,500	2,060,000	18,900	39,200	1,990,000

NA Not available.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Harmonized Tariff Schedule of the United States.

³Includes HTS codes 8102.95.0000 and 8102.99.0000.

Source: U.S. Census Bureau.

TABLE 7
U.S. IMPORTS OF MOLYBDENUM PRODUCTS, BY PRODUCT AND COUNTRY¹

Product and country	HTS ² code	2005		2006	
		Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Oxides and hydroxides, gross weight:	2825.70.0000				
Chile		773	\$27,300	322	\$12,200
China		18	274	216	8,840
Germany		99	2,840	67	2,430
Uzbekistan		342	11,900	18	737
Other		4	150	7	60
Total		1,240	42,500	629	24,300
Molybdates all, contained weight:	Various ³				
Belgium		2	202	34	1,340
Canada		6	100	8	214
Chile		1,060	22,400	414	16,800
China		1,480	29,000	377	14,500
Germany		93	1,090	70	3,420
Other		107	2,040	13	682
Total		2,750	54,800	915	36,900
Molybdenum orange, gross weight:	3206.20.0020				
Canada		702	4,040	718	4,650
Germany		9	31	12	66
India		6	9	14	23
Korea, Republic of		(6)	3	3	14
Mexico		148	396	70	297
Other		119 ^r	301 ^r	7	64
Total		983	4,780	824	5,110
Ferromolybdenum, contained weight: ⁴	7202.70.0000				
Belgium		32	2,240	--	--
Canada		382	28,600	238	13,300
Chile		313	22,300	764	45,000
China		3,030	214,000	1,790	95,600
Korea, Republic of		36	2,510	15	582
Netherlands		57	3,480	25	1,450
Russia		--	--	26	1,510
United Kingdom		114	2,390	141	3,240
Other		83 ^r	2,450 ^r	58	3,800
Total		4,050	278,000	3,060	165,000
Other, gross weight:	Various ⁵				
Austria		312	31,100	247	21,400
Chile		6	70	204	5,550
China		316	22,200	384	23,500
Germany		109	8,830	158	12,200
Hong Kong		8	395	67	4,560
Japan		81	7,400	63	4,920
Russia		12	1,270	12	1,910
United Kingdom		10	544	10	818
Other		26 ^r	1,060 ^r	13	823
Total		879	72,900	1,160	75,700

^rRevised. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Harmonized Tariff Schedule of the United States.

³Includes HTS codes 2841.70.1000 and 2841.70.5000.

⁴Ferromolybdenum contains about 60% to 65% molybdenum.

⁵Includes HTS codes 8102.10.0000, 8102.94.0000, 8102.95.3000, 8102.95.6000, 8102.96.0000, 8102.97.0000, and 8102.99.0000.

⁶Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 8
U.S. IMPORTS OF MOLYBDENUM ORE AND CONCENTRATES (INCLUDING
ROASTED AND OTHER CONCENTRATES), BY COUNTRY¹

Country	2005		2006	
	Quantity		Quantity	
	(metric tons of contained Mo)	Value (thousands)	(metric tons of contained Mo)	Value (thousands)
Canada	2,900	\$188,000	3,190	\$163,000
Chile	4,930	356,000	2,420	131,000
China	47	2,850	5	114
Mexico	3,460	170,000	3,400	43,300
Netherlands	48	3,230	--	--
Peru	271	14,900	1,830	54,000
Other	204 ^r	11,200 ^r	58	2,910
Total	11,900	746,000	10,900	395,000

^rRevised. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 9
U.S. IMPORTS FOR CONSUMPTION OF MOLYBDENUM PRODUCTS¹

Item	HTS ² code	2005			2006		
		Gross weight (metric tons)	Contained Mo (metric tons)	Value (thousands)	Gross weight (metric tons)	Contained Mo (metric tons)	Value (thousands)
Molybdenum ore and concentrates, roasted	2613.10.0000	8,570	5,380	\$306,000	9,570	5,900	\$167,000
Molybdenum ore and concentrates, other	2613.90.0000	13,800	6,480	440,000	10,900	5,000	227,000
Molybdenum chemicals:							
Oxides and hydroxides	2825.70.0000	1,240	NA	42,500	629	NA	24,300
Molybdates, all	Various ³	4,320	2,750	54,800	1,670	917	36,900
Molybdenum orange	3206.20.0020	983	NA	4,780	822	NA	5,110
Ferromolybdenum	7202.70.0000	6,340	4,050	278,000	4,810	3,060	165,000
Molybdenum powders	8102.10.0000	93	78	7,740	367	270	17,600
Molybdenum unwrought, bars and rods	8102.94.0000	99	99	5,750	191	191	10,800
Molybdenum waste and scrap	8102.97.0000	503	480	35,600	452	445	27,800
Molybdenum wire	8102.96.0000	21	NA	3,160	19	NA	2,550
Molybdenum, other	Various ⁴	163	NA	20,700	130	NA	17,000
Total		36,200	19,300	1,200,000	29,600	15,800	701,000

NA Not available.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Harmonized Tariff Schedule of the United States.

³Includes HTS codes 2841.70.1000 and 2841.70.5000.

⁴Includes HTS codes 8102.95.3000, 8102.95.6000, and 8102.99.0000.

Source: U.S. Census Bureau.

TABLE 10
MOLYBDENUM-PRODUCING MINES IN THE UNITED STATES IN 2006

State and mine	County	Operator	Source of molybdenum
Arizona:			
Bagdad	Yavapai	Phelps Dodge Corp.	Copper-molybdenum ore, concentrated.
Sierrita	Pima	do.	Do.
Colorado, Henderson	Clear Creek	do.	Molybdenum ore, concentrated.
Idaho, Thompson Creek	Custer	Thompson Creek Metals Co.	Do.
Montana, Continental Pit	Silver Bow	Montana Resources	Copper-molybdenum ore, concentrated.
Nevada, Robinson	White Pine	Quadra Mining, Ltd.	Do.
New Mexico:			
Chino	Grant	Phelps Dodge Corp.	Do.
Questa	Taos	Molycorp, Inc.	Molybdenum ore, concentrated.
Utah, Bingham Canyon	Salt Lake	Kennecott Utah Copper Corp.	Copper-molybdenum ore, concentrated.

TABLE 11
MOLYBDENUM: WORLD MINE PRODUCTION, BY COUNTRY^{1,2}

(Metric tons of contained molybdenum)

Country ³	2002	2003	2004	2005	2006 ^c
Armenia	2,884	2,763	2,950 ^e	3,000 ^{r, e}	3,000
Canada	8,043	9,090	9,520	7,935 ^r	7,840
Chile	29,466	33,374	41,883	48,041 ^r	43,278 ⁴
China ^e	29,300	31,000	38,500	40,000	43,900
Iran ^e	2,300	2,200	1,800	2,000	2,000
Kazakhstan	230	230	230 ^e	230	250
Kyrgyzstan ^e	250	250	250	250	250
Mexico	3,428	3,524	3,730	4,246	2,500
Mongolia	1,590	1,793	1,141	1,188	1,200
Peru	8,613	9,561	14,246	17,325	17,209 ⁴
Russia ^e	2,900	2,900	2,900	3,000	3,100
United States	32,300	33,500	41,500	58,000	59,800 ⁴
Uzbekistan ^e	500	500	500	575 ^r	600
Total	122,000	131,000	159,000	186,000 ^r	185,000

^cEstimated. ^rRevised.

¹World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Table includes data available through July 13, 2007.

³In addition to the countries listed, North Korea, Romania, and Turkey are thought to produce molybdenum, but output is not reported quantitatively, and available general information is inadequate to make reliable estimates of output levels.

⁴Reported figure.