

MOLYBDENUM

By John W. Blossom

Domestic survey data and tables were prepared by Barbara J. McNair, statistical assistant and the world production table was prepared by Linder Roberts, international data coordinator.

Molybdenum is a refractory metallic element used principally as an alloying agent in steel, cast iron, 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 or ferromolybdenum, is frequently used in combination with or added to chromium, columbium, manganese, nickel, 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 usage 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 demand that is expected to grow at a greater rate than that of most other alloying metals.

Distribution of molybdenum reserves and productive capacity was concentrated in a few countries of the world. World mine output was estimated to be 123,000 metric tons (molybdenum contained in concentrate), of which, in descending order of production, the United States, China, Chile, Mexico, and Canada provided 91%. These countries also possessed about 90% of the estimated 12 million metric tons of molybdenum in the world reserve base. [All units are metric tons of contained molybdenum unless otherwise noted.]

Production

Domestic production data for molybdenum were derived by the U.S. Geological Survey by means of three separate voluntary surveys. These surveys are Molybdenum Ore and Concentrate (annual), Molybdenum Concentrate (monthly), and Molybdenum Products and Molybdenum Concentrates (monthly). Surveys are sent to all operations that produce molybdenum ore and products. All 10 operations to which surveys were sent responded, representing 100% of the U.S. production shown in table 1.

In 1999, U.S. domestic mine production of molybdenum concentrate decreased from 53,300 tons in 1998 to 43,000 tons, which was about 35% of world production. World mine production of molybdenum concentrate decreased to 123,000 tons in 1999 from 135,000 tons in 1998. Net production of molybdenum products decreased by 14,600 tons in 1999. (See tables 1, 2, 7, and 8.)

On July 15, Cyprus Amax Minerals Company and ASARCO

Incorporated announced an agreement for the combination of the two companies in a "merger-of-equals" transaction. The new company, Asarco Cyprus Incorporated, would be the largest publically traded copper/molybdenum producer in the world. Under terms of the proposed merger, Cyprus Amax shareholders would receive 0.765 shares in the new company per share of common stock, while Asarco shareholders would get a direct conversion. The merger was expected to realize an annual cost savings of \$150 million from corporate overhead, administrative, and other cost savings. The corporate headquarters will be in New York City, while the operational headquarters will be in Tempe, AZ (Cyprus Amax Minerals Company, 1999).

On, August 20, Cyprus Amax and Asarco jointly announced that each had scheduled shareholder meetings for September 30 to approve the previously announced merger. Moreover, it was announced that, based on further review of combined operations, the anticipated operating cost savings from the merger had escalated to \$200 million per year. As part of the cost savings, Cyprus' Denver office would be closed, and Asarco's New York office would be relocated to New Jersey. The two companies also announced receipt of an unsolicited proposal from Phelps Dodge Corp. to negotiate an agreement for Phelps Dodge to acquire both companies in exchange for Phelps Dodge stock: 0.3756 Phelps Dodge shares for each Asarco share and 0.2874 Phelps Dodge shares for each Cyprus Amax share. Cyprus Amax and Asarco further indicated their intent to proceed with their own merger, rejecting Phelps Dodge's solicitation (ASARCO Incorporated, 1999c).

On August 25, Cyprus Amax and Asarco jointly announced improved terms for their own merger and a willingness to negotiate with Phelps Dodge on a three-way merger under certain conditions. Both companies were willing to negotiate with Phelps Dodge if proposed exchange ratios for Asarco and Cyprus Amax were increased 0.5300 and 0.4055 per share, respectively, and if Phelps Dodge agreed to underwrite the risk of antitrust action. Asarco and Cyprus improved the terms of their own merger by including a \$5.00 per share payment to stockholders of the combined Asarco Cyprus Incorporated (Cyprus Amax Minerals and ASARCO Incorporated, 1999a).

On August 27, Phelps Dodge announced that it was rejecting the offer of a three-way merger and that it intended to take its acquisition offer directly to Asarco and Cyprus Amax shareholders. The company also announced that it had filed documents with the Securities and Exchange Commission that outlined its plan to solicit proxies from Cyprus and Asarco shareholders, and that it would file suit against the board of

directors of Cyprus and Asarco alleging a breach of fiduciary duty. In addition, Phelps Dodge scheduled a special meeting of its shareholders on October 13 to approve its proposed issuance of shares. On August 29, Cyprus and Asarco responded by urging their shareholders to reject Phelps Dodge's bid as one simply intended to disrupt their own proposed merger (W.L. Watts, August 30, 1999, Asarco, Cyprus urge rejection of hostile bid claims Phelps Dodge merely trying to break up merger, CBS Market Watch, accessed August 31, 1999, at URL <http://cbs.marketwatch.com>).

On September 7, Cyprus Amax and Asarco urged their shareholders to approve their merger of equals on September 30, under terms previously announced, and to reject Phelps Dodge's offer as being inequitable on the basis of percentage ownership. The two companies claimed the Asarco-Cyprus stockholders would own only 43% of the three-way enterprise, yet contribute 57% of production, 61% of reserves, four of the five lowest cost mines, 91% of cash assets, and other cost advantages. Cyprus Amax and Asarco also warned that conditions of the three-way merger could not be met prior to their self-imposed September 30 deadline for voting on their own merger (Cyprus Amax Minerals and ASARCO Incorporated, 1999b).

On September 10, Phelps Dodge announced that it had filed its premerger notifications with the Federal Trade Commission and Antitrust Division of the U.S. Department of Justice under the Hart-Scott-Rodino Act for its proposed acquisitions of Asarco and Cyprus Amax, and that the 30-day waiting period would expire on October 10 (Phelps Dodge Corp., 1999c).

On September 20, Asarco announced the filing of a complaint seeking an injunction and damages against Phelps Dodge in Federal Court alleging that Phelps Dodge's unsolicited takeover attempt violated U.S. antitrust laws. Asarco cited Phelps Dodge's failure to make an early premerger notification under the Hart-Scott-Rodino Act seeking approval from the Justice Department regarding antitrust implications of the merger. Cyprus and Asarco had already received such clearances for their merger (ASARCO Incorporated, 1999b).

On September 22, Phelps Dodge announced that it had increased its offer to acquire Asarco and Cyprus Amax and had added cash components to both offers that would provide about 40% premiums to shareholders of Asarco and Cyprus Amax. The new offer was to acquire Asarco shares for 0.2880 Phelps Dodge shares plus \$9.00 in cash and Cyprus shares for 0.2203 Phelps shares and \$6.89 in cash—equivalent to \$25.47 per share and \$19.49 per share, respectively. All cash or all stock alternatives were also offered (Phelps Dodge, 1999d). On September 24, Phelps Dodge announced that it had received antitrust clearance from the U.S. Department of Justice for its proposed acquisition of Asarco and Cyprus Amax and that no divestitures would be required (Phelps Dodge Corp., 1999e).

On September 24, Grupo Mexico, S.A. de C.V. entered the contest for control of Asarco when it tendered a cash offer of \$26 per share of Asarco stock (Grupo Mexico, S.A. de C.V., 1999a). Grupo Mexico, through its subsidiary Grupo Minero Mexico, owns the Cananea and La Caridad mines, smelters, and refineries. This offer was not surprising given Asarco's

long-term involvement in the Mexican copper mining sector that dates back to 1901, when Asarco first began mining in Mexico. In 1965, Asarco Mexicana was formed with 51% Mexican ownership. In 1978, Grupo Mexico was formed, with subsidiary Mexico Desarrolla Industrial Minero, S.A. de C.V. (Medisma) controlling its mining assets. In 1996, Asarco still retained a 23.6% interest in Medisma and in 1997 it reduced its holdings, selling 106.3 million of its 162.6 million shares of Grupo Minero Mexico (formerly Medisma).

On September 30, Phelps Dodge and Cyprus Amax announced that they had signed a merger agreement under which Phelps Dodge would acquire Cyprus Amax for \$7.61 in cash and 0.2203 Phelps Dodge shares for every Cyprus share. Phelps Dodge anticipated cash cost savings of at least \$100 million from the merger (Phelps Dodge Corp. and Cyprus Amax Minerals, 1999).

On October 6, Phelps Dodge announced that it had signed a definitive merger agreement with Asarco under which it would acquire Asarco for \$14.75 and 0.2513 Phelps Dodge shares per Asarco share, with the offer expiring at midnight on October 21. An all cash option of \$29.50 per Asarco share and an all stock option of 0.50266 per Asarco share were also tendered. Phelps Dodge anticipated a cash operating savings from the three-way merger of at least \$200 million (Phelps Dodge Corp., 1999f).

On October 7, Grupo Mexico increased its offer for Asarco to \$2.24 billion in cash, \$29.50 per share. On October 15, Asarco notified Phelps Dodge that it would accept a newly increased cash purchase offer from Grupo Mexico of \$2.25 billion, \$29.75 per share, thus terminating its merger agreement with Phelps Dodge and paying Phelps Dodge a contractual termination fee of \$30 million (ASARCO Incorporated, 1999a). Phelps Dodge had steadfastly refused to increase its offer to match or surpass that of Grupo Mexico.

On October 18, Phelps Dodge announced that its offer to exchange \$7.61 in cash and 0.2203 Phelps Dodge shares for each share of Cyprus Amax had expired, and that about 89.6% of the outstanding shares of Cyprus Amax had been tendered and accepted. The final distribution between cash and stock was adjusted to reflect over-subscription by shareholders requesting an all cash payment option (Phelps Dodge Corp., 1999a). On December 2, Phelps Dodge announced that it had acquired all the remaining outstanding shares of Cyprus Amax, and that Cyprus Amax would cease trading on the New York Stock Exchange (Phelps Dodge Corp. 1999b).

On November 12, Grupo Mexico, S.A. de C.V. announced that it had executed financing agreements with the Chase Manhattan Bank to provide funding for its purchase of all the outstanding shares of Asarco. By November 12, Grupo owned or had received tender offers for almost 90% of Asarco's common stock (Grupo Mexico, S.A. de C.V., 1999b). On December 14, Grupo announced that it had entered into a definite agreement to sell the specialty chemicals division of Asarco, its "recently acquired subsidiary," for \$503 million to Cookson Group plc. The proceeds were to be committed to reducing the \$817 million debt incurred in the purchase of Asarco. Grupo further planned to reduce its acquisition debt

through the sale of its aggregate division (Grupo Mexico, S.A. de C.V., 1999c). (See table 7.)

Consumption

In 1999, consumption of molybdenum concentrate decreased 1,400 tons compared with that of 1998. Domestic mine production of molybdenum concentrate was roasted, exported for conversion, or purified to lubrication-grade molybdenum disulfide. Technical-grade molybdcic oxide consumption decreased by about 5% in 1999 compared with that of 1998. Oxide was the chief form of molybdenum used by industry, particularly in stainless and alloy steel, cast iron, and superalloys. Some of the oxide was, however, converted to other molybdenum products, such as ferromolybdenum, high-purity oxide, ammonium and sodium molybdate, and metal powder. (See tables 1 and 3.)

Stocks

In 1999, producer plus consumer industry stocks were 12,000 tons, a decrease of 4,230 tons compared with those of 1998. Inventories of molybdenum in concentrate at producer locations decreased by about 1,680 tons. Producer stocks of molybdenum in products, such as oxide, ferromolybdenum, molybdate, metal powders, and other types, decreased by about 2,450 tons. Consumer stocks of molybdenum contained in various materials decreased by 100 tons compared with those of 1998. Stocks of 12,000 tons represented about a 35-week supply. Supply is calculated as reported stocks (table 1) divided by annual consumption (table 3).

Prices

Prices are from Platt's Metals Week (1999) and are in U.S. dollars per kilogram of contained molybdenum. At the beginning of 1999, the prices were molybdenum concentrates (MoCons), \$4.630; molybdcic oxide (MoX), \$5.897; and ferromolybdenum (FeMo), \$8.322. At the beginning of the second quarter, the prices were MoCons, \$3.750; MoX, \$5.8420; and FeMo, \$8.322. At the start of the third quarter, the prices were MoCons, \$3.750; MoX, \$5.842; and FeMo, \$8.102. At the start of the fourth quarter, the prices were MoCons, \$3.750; MoX, \$5.787; and FeMo, \$8.157. At the end of the fourth quarter, the prices were MoCons, \$3.748; MoX, \$5.625; and FeMo, \$7.716. The annual average prices were MoCons, \$3.840; MoX, \$5.861; and FeMo, \$8.157.

Foreign Trade

Exports of molybdenum in concentrate and in molybdcic oxide were about 33% lower than those of 1998; molybdenum concentrate exports were about 65% of domestic mine production. About 90% of reported exports of concentrates went to Belgium, Canada, Chile, Japan, the Netherlands, and the United Kingdom. All 1999 molybdenum exports contained about 32,400 tons of molybdenum and were valued at \$186

million, a decrease from \$272 million in 1998.

The United States imported about 12,900 tons of molybdenum contained in various materials, which was about 200 tons more than those imported in 1998. Total value of all forms of molybdenum imported decreased from \$130 million to \$104 million in 1999. In terms of value, the major form imported was ferromolybdenum. (See tables 4, 5, and 6.)

World Review

Capacity.—As of December 31, 1999, U.S. rated capacity for mines and mills was estimated to be 90,000 tons per year of contained metal. Rated capacity is defined as the maximum quantity of product that can be produced in a period of time on a normally sustainable long-term operating rate based on the physical equipment of the plant and given acceptable routine operating procedures involving labor, energy, materials, and maintenance. Capacity included operating plants and plants temporarily closed that, in the judgment of the author, can be brought into production within a short period of time with minimum capital expenditure.

Reserves.—With a reserve base of molybdenum estimated to be 5.4 million tons, the United States had 45% of the world molybdenum reserve base. About 90% of U.S. reserves was in large porphyry or disseminated deposits mined or anticipated to be mined primarily for molybdenum; these deposits were in Alaska, Colorado, Idaho, Nevada, New Mexico, and Utah. Other molybdenum sources contribute insignificantly to U.S. reserves.

Most Canadian reserves of molybdenum are in British Columbia. Other Canadian reserves were associated with molybdenum and copper-molybdenum porphyry deposits in British Columbia and with minor sources in New Brunswick and Quebec.

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. Mexico and Peru had substantial reserves. La Caridad deposit in Mexico was a large producer. Numerous other copper porphyries 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 estimated to be substantial, but definitive information about the current sources of supply or prospects for future development in these two countries was lacking.

Outlook

Because of abundant resources and adequate production capacity in the United States, China, Chile, and other countries, the future requirement for molybdenum should be

readily met by the world producers. The principal use for molybdenum will continue to be in chemicals/catalysts and as an additive in steel manufacturing in general, most importantly alloy and stainless steel. Strong growth in production of stainless steel and superalloys can be expected in the near term with generally healthy economic conditions over the next few years.

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TABLE 1
SALIENT MOLYBDENUM STATISTICS 1/

(Metric tons, of contained molybdenum, unless otherwise specified)

	1995	1996	1997	1998	1999
United States:					
Concentrate:					
Production	60,900	54,900	60,900	53,300	43,000
Shipments	61,700	57,900	59,100	52,100 r/	40,700
Value thousands	\$651,000	\$456,000	\$406,000	\$200,000	\$203,000
Reported consumption	25,500	24,500	24,300	35,900	34,500
Imports for consumption	5,570	5,480	6,330	6,570	6,390
Stocks, December 31:					
Concentrate, mine and plant	5,390	2,470	3,660	6,270	4,580
Product producers 2/	4,820	5,780	6,500	7,780	5,340
Consumers, by end use	2,170 r/	1,650	1,150	2,170	2,070
Total	12,400	9,900	11,300 r/	16,200	12,000
Primary products:					
Production	46,000	46,300	48,000	57,200	39,800
Shipments	24,000	24,100	25,900	38,000	39,000
Reported consumption, by end use	19,900	20,900	20,000	18,800 r/	17,700
World: Mine production	136,000	126,000	139,000	135,000	123,000 e/

e/ Estimated. r/ Revised.

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

2/ Includes technical and purified molybdc oxide, briquets, ferromolybdenum, phosphomolybdc acid, molybdenum disulfide, molybdc acid, ammonium molybdate, sodium molybdate, calcium molybdate, molybdenum metal, pellets, molybdenum pentachloride, and molybdenum hexacarbonyl.

TABLE 2
PRODUCTION, SHIPMENTS, AND STOCKS OF MOLYBDENUM PRODUCTS IN THE UNITED STATES 1/

(Metric tons of contained molybdenum)

	Metal powder		Other 2/		Total	
	1998	1999	1998	1999	1998	1999
Received from other producers	--	--	5,460	19,100	5,460	19,100
Gross production during year	4,470	4,090	52,800	35,700	57,200	39,800
Molybdenum products used to make other products	2,200	2,200	21,200	18,300	23,400	20,500
Net production	2,270	1,880	31,600	17,400	33,900	19,200
Shipments	622	580	37,300	38,500	38,000	39,000
Producer stocks, December 31	199	158	7,580	5,180	7,780	5,340

-- Zero.

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

2/ Includes ferromolybdenum, molybdc oxides, phosphomolybdc acid, molybdenum disulfide, molybdc acid, ammonium molybdate, calcium molybdate, sodium molybdate, molybdenum metal, pellets, molybdenum pentachloride, and molybdenum hexacarbonyl.

TABLE 3
U.S. REPORTED CONSUMPTION, BY END USES, AND CONSUMER STOCKS OF MOLYBDENUM MATERIALS 1/

(Kilograms, contained molybdenum)

End use	Molybdic oxides	Ferro molybdenum 2/	Ammonium and sodium molybdate	Molybdenum scrap	Other	Total
1998:						
Steel:						
Carbon	497,000 r/	280,000	--	--	39,600	817,000 r/
High-strength low-alloy	505,000	153,000 r/	--	--	--	657,000 r/
Stainless and heat-resisting	2,980,000 r/	672,000 r/	--	(3/)	89,100 r/	3,740,000 r/
Full alloy	2,260,000	2,010,000	--	--	27,900	4,290,000
Tool	651,000 r/	76,900 r/	--	(4/)	18,700 r/	746,000 r/
Total	6,890,000 r/	3,190,000	--	--	175,000 r/	10,300,000
Cast irons (gray, malleable, ductile iron)	241,000	783,000 r/	--	--	27,700	1,050,000 r/
Superalloys	975,000 r/	W	--	(5/)	1,220,000	2,190,000 r/
Alloys (other than steels, cast irons, superalloys):						
Welding materials (structural and hard-facing)	--	64,400 r/	--	--	5,600 r/	70,000 r/
Other alloys	W	69,700 r/	--	--	75,500 r/	145,000 r/
Mill products made from metal powder 6/	--	--	--	--	2,410,000	2,410,000
Cemented carbides and related products 7/	--	--	--	--	93	93
Chemical and ceramic uses:						
Pigments	W	--	W	--	--	W
Catalysts	967,000	--	W	--	W	967,000
Other	W	--	--	--	209,000 r/	209,000 r/
Miscellaneous and unspecified uses:						
Lubricants	--	--	--	--	230,000 r/	230,000 r/
Other	12,600 r/	93,100 r/	1,110,000 r/	--	62,300 r/	1,270,000 r/
Grand total	9,080,000 r/	4,200,000 r/	1,110,000 r/	--	4,410,000 r/	18,800,000 r/
Stocks, December 31, 1998	873,000	392,000 r/	46,700	19,300	839,000	2,170,000
1999:						
Steel:						
Carbon	395,000	339,000	--	--	68,500	803,000
High-strength low-alloy	430,000	123,000	--	--	--	553,000
Stainless and heat-resisting	3,050,000	497,000	--	--	57,100	3,600,000
Full alloy	1,870,000	2,000,000	--	--	27,900	3,900,000
Tool	W	88,600	--	--	17,800	106,000
Total	5,750,000	3,050,000	--	--	171,000	8,960,000
Cast irons (gray, malleable, ductile iron)	W	715,000	--	--	27,000	742,000
Superalloys	994,000	W	--	(5/)	957,000	1,950,000
Alloys (other than steels, cast irons, superalloys):						
Welding materials (structural and hard-facing)	--	37,300	--	--	2,030	39,300
Other alloys	--	46,000	--	--	75,500	121,000
Mill products made from metal powder 6/	--	--	--	--	2,390,000	2,390,000
Cemented carbides and related products 7/	--	--	--	--	67	67
Chemical and ceramic uses:						
Pigments	--	--	W	--	W	W
Catalysts	974,000	--	W	--	W	974,000
Other	W	--	--	--	17,400	17,400
Miscellaneous and unspecified uses:						
Lubricants	--	--	--	--	214,000	214,000
Other	930,000	48,400	1,110,000	--	233,000	2,320,000
Grand total	8,640,000	3,890,000	1,110,000	--	4,090,000	17,700,000
Stocks, December 31, 1999	960,000	207,000	36,600	18,700	850,000	2,070,000

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

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

2/ Includes calcium molybdate.

3/ Included with "Other" of "Tool" category.

4/ Included with "Other" of "Superalloys" category.

5/ Included with "Other" of "Welding materials" category.

6/ Includes construction, mining, oil and gas, and metal working machinery.

7/ Includes ingot, wire, rod, and sheet.

TABLE 4
U.S. EXPORTS OF MOLYBDENUM PRODUCTS, BY PRODUCT AND COUNTRY 1/

Product and country	HTS No.	1998		1999	
		Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Oxides and hydroxides, gross weight:	2825.70.0000				
Belgium		42	\$420	91	\$688
Brazil		--	--	10	105
Canada		559	4,190	546	4,920
Germany		3	26	2	33
Japan		308	2,430	153	1,260
Mexico		68	407	294	1,250
United Kingdom		19	103	1	8
Other		98	768	28	246
Total		1,100	8,340	1,130	8,510
Molybdates all, contained weight:	2841.70.0000				
Australia		25	87	4	42
Brazil		3	25	1	4
Canada		453	2,380	497	2,090
China		--	--	(2/)	6
Colombia		7	38	2	11
Honduras		2	34	2	22
Japan		383	2,000	287	1,940
Korea, Republic of		36	205	94	927
Mexico		33	234	47	287
Netherlands		377	1,770	319	1,260
Singapore		196	4,290	37	335
Taiwan		6	46	2	32
Thailand		--	--	2	31
Venezuela		60	166	--	--
Other		6 r/	110 r/	10	72
Total		1,590	11,400	1,300	7,050
Ferromolybdenum, contained weight: 3/	7202.70.0000				
Australia		2	21	2	20
Canada		915	5,760	935	5,020
China		221	1,960	336	3,270
Japan		99	2,380	83	3,230
Korea, Republic of		2	31	18	167
Mexico		151	1,200	132	653
Venezuela		--	--	(2/)	8
Other		1 r/	25 r/	--	--
Total		1,390 r/	11,400 r/	1,510	12,400
Powder, gross weight:	8102.10.0000				
Brazil		11	358	18	536
Canada		5	176	3	116
France		21	656	3	111
Germany		14	515	54	1,290
India		15	402	2	76
Italy		--	--	(2/)	3
Japan		22	700	11	332
Mexico		--	--	1	42
Spain		13	439	6	167
Sweden		52	967	50	765
Switzerland		(2/)	8	6	123
Taiwan		133	3,130	186	3,470
United Kingdom		1	67	(2/)	20
Other		34	1,230	22	491
Total		321	8,650	362	7,540

See footnotes at end of table.

TABLE 4--Continued
U.S. EXPORTS OF MOLYBDENUM PRODUCTS, BY PRODUCT AND COUNTRY 1/

Product and country	HTS No.	1998		1999	
		Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Molybdenum unwrought, gross weight:	8102.91.0000				
Australia		13	\$722	2	\$51
Brazil		--	--	(2/)	2
Canada		13	301	16	411
China		8	108	(2/)	7
France		21	369	9	147
Germany		14	146	3	58
India		12	272	--	--
Japan		8	201	44	675
Korea, Republic of		--	--	3	123
Mexico		--	--	(2/)	26
Netherlands		12	184	1	50
Sweden		(2/)	16	(2/)	23
United Kingdom		59	635	39	407
Other		21 r/	247	50	445
Total		181	3,200	167	2,430
Molybdenum wrought, gross weight:	8102.92.0000				
Brazil		(2/)	6	(2/)	33
Canada		30	895	34	961
France		1	411	2	359
Germany		7	590	6	588
India		(2/)	51	(2/)	36
Italy		1	77	(2/)	3
Japan		54	2,980	30	2,020
Korea, Republic of		3	166	2	229
Mexico		4	270	1	120
Netherlands		(2/)	6	5	125
United Kingdom		25	1,420	49	2,490
Other		8	335	18	1,090
Total		133	7,200	147	8,050
Wire, gross weight:	8102.93.0000				
Argentina		(2/)	47	(2/)	17
Belgium		(2/)	32	3	3,760
Brazil		18	731	38	1,440
Canada		1	113	2	180
France		30	1,270	5	323
Germany		17	1,020	25	1,600
Hungary		45	2,540	53	2,980
India		26	1,230	29	1,320
Indonesia		3	187	1	92
Italy		3	186	2	109
Japan		29	1,660	2	179
Korea, Republic of		10	522	17	810
Mexico		1	338	2	282
Netherlands		2	66	--	--
South Africa		(2/)	61	(2/)	58
Spain		2	98	3	125
Sweden		7	252	7	282
Taiwan		5	410	(2/)	19
United Kingdom		(2/)	85	(2/)	81
Other		13	184	11	278
Total		212	11,000	200	13,900

r/ Revised. -- Zero.

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

2/ Less than 1/2 unit.

3/ Ferromolybdenum contains about 60% to 65% molybdenum.

Source: U.S. Census Bureau.

TABLE 5
U.S. EXPORTS OF MOLYBDENUM ORE AND CONCENTRATES (INCLUDING ROASTED
AND OTHER CONCENTRATES), BY COUNTRY 1/

(Metric tons)

Country	1998		1999	
	Quantity (contained molybdenum)	Value (thousands)	Quantity (contained molybdenum)	Value (thousands)
Australia	82	\$539	41	\$422
Belgium	4,470	23,000	4,740	18,800
Brazil	60	475	66	723
Canada	731	4,120	1,350	6,720
Chile	6,840	20,400	2,420	6,910
China	423	829	1,190	2,070
Germany	461	1,640	122	629
India	9	200	102	511
Italy	449	2,280	264	1,580
Japan	4,410	31,300	2,320	14,300
Korea, Republic of	9	115	109	720
Mexico	4,220	19,900	129	718
Netherlands	12,800	68,700	8,620	44,500
Sweden	894	4,870	613	3,450
United Kingdom	5,480	31,000	5,530	25,900
Other	362	1,640	231	1,250
Total	41,700	211,000	27,900	129,000

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

Source: U.S. Census Bureau.

TABLE 6
U.S. IMPORTS FOR CONSUMPTION OF MOLYBDENUM 1/

Item	HTS No.	1998			1999		
		Gross weight (metric tons)	Contained molybdenum	Value (thousands)	Gross weight (metric tons)	Contained molybdenum	Value (thousands)
Molybdenum ore and concentrates, roasted	2613.10.0000	8,020	5,090	\$39,600 r/	9,020	5,710	\$33,200
Molybdenum ore and concentrates, other	2613.90.0000	2,710	1,480	7,570 r/	1,310	680	2,450
Molybdenum oxides and hydroxides	2825.70.0000	1,180	NA	9,400 r/	746	NA	5,100
Molybdates of ammonium	2841.70.0000	1,240	684	8,810 r/	1,240	730	6,650
Molybdates all others	2841.70.5000	192	113	982	181	83	727
Molybdenum orange	3206.20.0000	2,050	NA	7,950	1,550	NA	6,720
Ferromolybdenum	7202.70.0000	7,690	4,830	44,000	8,350	5,160	37,300
Molybdenum powders	8102.10.0000	110	103	3,210	114	106	3,240
Molybdenum unwrought	8102.91.1000	145	137	2,110	14	13	542
Molybdenum waste and scrap	8102.91.5000	296	292	4,080	470	463	6,130
Molybdenum wire	8102.93.0000	6	NA	500	8	NA	638
Molybdenum other	8102.99.0000	8	NA	1,650	11	NA	1,690
Total		23,700	12,700	130,000 r/	23,000	12,900	104,000

r/ Revised. NA Not available.

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

Source: U.S. Census Bureau.

TABLE 7
MOLYBDENUM-PRODUCING MINES IN THE UNITED STATES IN 1999

State and mine	County	Operator	Source of molybdenum
Arizona:			
Bagdad	Yavapai	Phelps Dodge Corp.	Copper-molybdenum ore, concentrated.
Morenci 1/	Greenlee	do.	Do.
San Manuel 2/	Pinal	BHP Copper Inc.	Do.
Sierrita	Pima	Phelps Dodge Corp.	Do.
Colorado:			
Henderson	Clear Creek	do.	Molybdenum ore, concentrated.
Idaho:			
Thompson Creek	Custer	Thompson Creek Metals Co.	Do.
Montana:			
Continental	Silver Bow	Montana Resources Inc.	Copper-molybdenum ore, concentrated.
New Mexico:			
Chino	Grant	Phelps Dodge Corp.	Do.
Questa	Taos	UNOCAL	Molybdenum ore, concentrated.
Utah:			
Bingham Canyon	Salt Lake	Kennecott Utah Copper Corp.	Copper-molybdenum ore, concentrated.

1/ On June 30, 1999, Phelps Dodge announced a plan to close the smaller of two concentrators at their Morenci mining operations.

2/ Mine and mill closed in May 1999.

TABLE 8
MOLYBDENUM: WORLD MINE PRODUCTION, BY COUNTRY 1/ 2/

(Metric tons of contained molybdenum)

Country 3/	1995	1996	1997	1998	1999 e/
Armenia e/	1,500	1,800 4/	1,800	2,500	2,500
Canada	9,113	8,789	7,612	7,991	5,930 p/
Chile	17,889	17,415	21,339	25,298	27,268 4/
China e/	33,000	29,600	33,300	30,000	27,900
Iran e/	560 4/	560	600	600	600
Kazakhstan e/	75	100	100	100	110
Kyrgyzstan	NA	NA	NA	225 e/	250 4/
Mexico	3,883	4,210	4,842	5,949	6,000
Mongolia	1,822	2,201	1,992	1,993 r/	1,750 4/
Peru	3,411	3,711	3,835	4,344	4,400
Russia e/	3,000	2,000	2,000	2,000	2,400
United States	60,900	54,900	60,900	53,300	43,000 4/
Uzbekistan	400	500	500 e/	500 e/	500
Total	136,000	126,000	139,000	135,000	123,000

e/ Estimated. p/ Preliminary. r/ Revised. NA Not available.

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

2/ Table includes data available through June 16, 2000.

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

4/ Reported figure.