

Molybdenum

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SUMMARY

At the beginning of 1995, molybdenum prices were at their highest level in 15 years due to a supply shortage. In January 1994, as reported by Metals Week, dealer oxide (MoO_3) prices were around US\$6.00/kg of contained molybdenum, and they had increased to about US\$30/kg by year-end. The prices reached their peak of US\$34.17/kg in January 1995 and, during the first quarter of the year, stayed exceptionally high, but then decreased gradually to US\$9.26/kg by the end of December. In 1996, prices started the year at US\$9.26/kg and finished the year at US\$9.04/kg.

Sales earnings for 1995 were considerably higher than in 1994 for all molybdenum producers. This important revenue increase was attributable to sharply higher molybdenum prices in 1995. In 1996, prices were back to "normal" compared to the exceptionally high prices of early 1995.

During 1995, many "dormant" projects were reviewed: Cyprus Amax Minerals Company temporarily restarted the Climax primary molybdenum mine in Colorado and boosted production at the Henderson mine; ASARCO Incorporated restarted its by-product molybdenum recovery circuit at its Mission copper mine in Arizona; and Molycorp, Inc. re-opened the Questa primary mine in New Mexico.

CANADIAN DEVELOPMENTS

Canada is the fourth largest producer of molybdenum in the world after the United States, China and Chile. In 1996, Canadian companies produced approximately 8845 t of contained molybdenum in the form of molybdenum ore and concentrate, which was down from the 9113 t produced in 1995 and the 9759 t produced in 1994. The production decrease in

1996 was a combined result of the closure of the Island Copper mine and the lower grade of ore being mined. The value of production was \$113 million in 1994; it jumped to \$203 million in 1995, and then fell back to approximately \$103 million in 1996.

In 1995, Canadian molybdenum consumption remained at the same level as in 1994 after gradually increasing over a five-year period. Compared to 1990 levels, the 2000 t consumed in 1995 represented an increase of 69% (Figure 1).

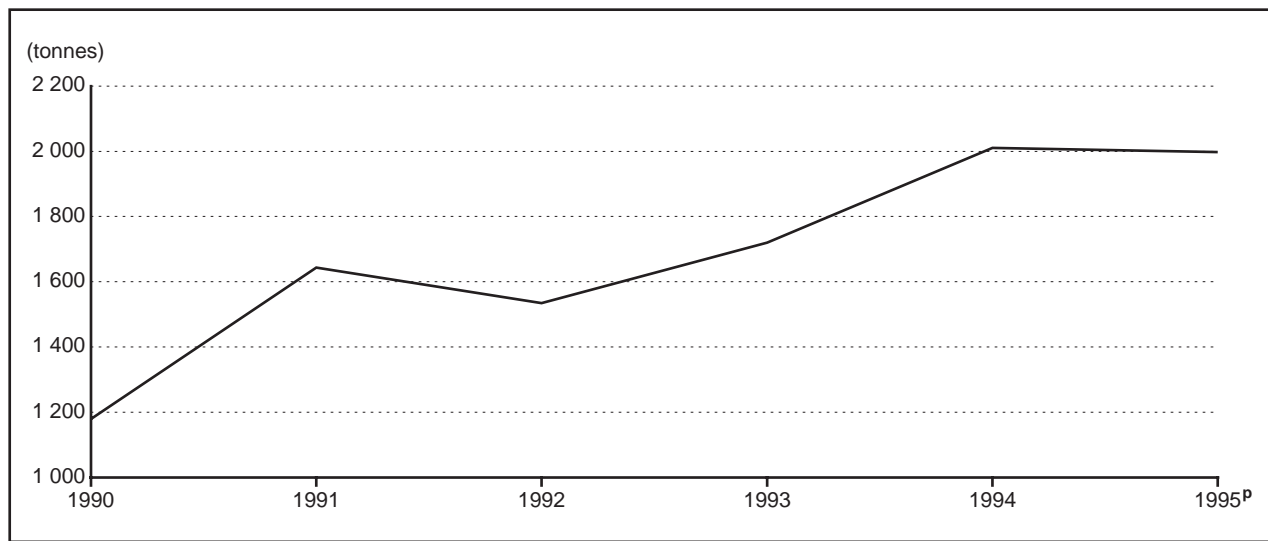
In 1995, 98% of Canadian molybdenum exports were sold as ore and concentrate (mainly roasted) and 1% as ferromolybdenum. Total exports of all types of molybdenum, which have averaged 9400 t/y since 1993, will be lower in 1996 at about 8700 t. The largest market for Canadian molybdenum is Japan followed by the United States.

The volume of imports is less important than exports in Canadian molybdenum trade. However, imports increased considerably between 1993 and 1995 from 2000 t to 4500 t respectively. Imports for 1996 will decrease to about 3600 t. Canadian imports were split among roasted concentrate, oxides, and ferromolybdenum, which was the major type of molybdenum imported in 1995 and 1996. Canada imports most of its molybdenum from the United States. In 1995, Canada increased its imports by 127% compared to 1993 while, for the same period, Canadian exports fell by 8%.

Canada has three operating molybdenum mines, all located in British Columbia; one is a primary producer and two are producers of copper with molybdenum as a by-product. A third copper mine, the Huckleberry project, is expected to start production by the end of 1997.

The Endako mine owned by Placer Dome Inc. is the primary producer. The mine is located at Endako, British Columbia, just above the 54th parallel close to Fraser Lake (about 150 km west of Prince George). The mine has reserves of about 70 Mt of ore grading 0.082% molybdenum. Placer Dome has two roasters with a total capacity of 10 800 t/y and an ultra-pure lubricant-grade molybdenum disulfide site with a capacity of 450 t/y. Long-term contracts represent 85% of Endako's total sales, with Japan being its largest market; the other 15% is sold through

Figure 1
Canadian Consumption of Molybdenum, 1990-95



Source: Natural Resources Canada.

^P Preliminary.

traders. Molybdenum production in 1997 will decrease due to a lower grade of mined ore.

The following two copper mines produce molybdenum as a by-product:

- Highland Valley Copper is a joint venture with the following ownership: Cominco Ltd., 50%; Rio Algom Limited, 33.6%; Teck Corporation, 13.9%; and Highmont Mining Company, 2.5%. The mine is located at Highland Valley, British Columbia, above the 50th parallel close to Logan Lake (about one hour's drive from Kamloops). Highland Valley reserves are estimated at 504 Mt grading an average of 0.42% copper and 0.007% molybdenum. The material comes from two open pits: 80% from the Valley pit with an average molybdenum grade of 0.005%, and 20% from the Lornex pit with a higher grade of 0.012-0.014%. Its molybdenum concentrate production in 1995 was 2925 t at an average grade of 53.5%. All of the molybdenum is sold through traders. Three quarters of Highland Valley's output of molybdenum concentrate is roasted in Europe. Production for both pits is currently planned until the year 2008. However, the company is still carrying on with exploration programs to ensure the longest possible economic life of the operation.
- Gibraltar Mines Limited was acquired by Westmin Resources Limited from Placer Dome Inc. in the fall of 1996. The McLeese Lake mine, located at McLeese Lake (above the 52nd parallel), British Columbia, has reserves of about 76 Mt of proven and probable ore and 229 Mt of measured and indicated ore. The proven ore grades 0.31% copper and

0.009% molybdenum. The mine's production of molybdenum was halted in December 1992 (last month of production, although shipments continued until April 1993) because of low molybdenum prices. Its molybdenum recovery circuit was refurbished and production was brought back on stream in November 1995.

Huckleberry Mines Ltd. is owned 60% by Princeton Mining Corporation and 40% by a Japanese consortium (Mitsubishi Materials Corporation, Dowa Mining Co. Ltd., Furukawa Co. Ltd., and Marubeni Corporation). The mine will be managed and operated by Princeton Mining Corporation. The Huckleberry copper-molybdenum-gold-silver deposit is located near Houston, just below the 54th parallel. As a reference, it is located about 150 km southwest of the Endako mine. Its proven and probable reserves are 90 Mt grading 0.51% copper and 0.014% molybdenum. The mine is scheduled to begin production in October 1997 and will be operating at full capacity three months later. It has a life expectancy of 16 years with an average annual production of close to 600 t of molybdenum.

Extensive work has been done in evaluating projects that may contain molybdenum:

- Spokane Resources Ltd. is looking at its wholly owned Mac property in British Columbia, located about 100 km northwest of the Endako mine, where the company is planning to conduct an extensive diamond drilling program in 1997.
- Molycor Gold Corp. (formerly Amcorp Industries Inc.) and Verdstone Gold Corporation are working

on two molybdenum projects, both in British Columbia: the Crow-Rea property and the Salal Creek property. Crow-Rea is located 20 km west of Summerland in south-central British Columbia, and Salal Creek is located 70 km northwest of Pemberton, British Columbia.

- Pacific Sentinel Gold Corp. is studying its wholly owned Casino project located in southwest Yukon.

The Island Copper mine of BHP Minerals Canada Ltd. closed in December 1995 due to the depletion of ore reserves.

Under the Canada-U.S. Free Trade Agreement, trade in molybdenum products will be completely tariff free on January 1, 1998. Currently, roasted concentrate is the only type of molybdenum exported to the United States with a tariff; all the other forms of molybdenum are already tariff free.

WORLD DEVELOPMENTS

Argentina

The feasibility study on the El Pachon copper-molybdenum project in the San Juan province, 50% owned by Cambior Inc. of Canada, should be completed in 1997. El Pachon is expected to produce 800 000 t/y of copper concentrate grading 28% copper and 45% molybdenum. Its proven and probable reserves are 990 Mt grading 0.61% copper and 0.014% molybdenum. If the project goes into production, the molybdenum will be shipped to roasting facilities in Europe.

Elsewhere in Argentina, exploration work at the Agua Rica (formerly Mi Vida) copper-gold-molybdenum deposit in Catamarca province will continue in 1997. The deposit, jointly owned by BHP Minerals International Inc. (70%) and a Canadian company, Northern Orion Explorations Ltd. (30%), could contain about 400 000 t of molybdenum. Although the deposit is geologically rich with a good grade of molybdenum, it is complex and dispersed, and it is therefore questionable whether it will be economical to mine.

Chile

Chile's molybdenum production was 16 028 t in 1994, 17 500 t in 1995 (an increase of 9%) and an estimated 18 400 t in 1996 (an increase of 5%). Most of Chile's production is concentrated in the four mines belonging to state-owned Codelco-Chile, which account for approximately 8% of the world molybdenum market. There are only two other Chilean copper mines where molybdenum is recovered: the Disputada mine owned by Exxon Minerals Chile Inc., and the Los Pelambres mine owned by Anaconda Minerals Company.

Codelco-Chile produced 15 950 t of molybdenum in 1994 and 16 717 t in 1995 with its Chuquicamata mine accounting for 64% of the total, followed by the El Teniente mine (16%) and its Andina and El Salvador mines (10% each).

Codelco-Chile's Andina mine has embarked on an expansion that will almost double its ore production. The Unit Mill project consists of the construction of a unified crusher that will produce finer material, which could increase the recovery of molybdenum from 55% to 58.8% and could increase production by 115 t/y. On the other hand, molybdenum output from the Chuquicamata mine will decrease due to the lower molybdenum content in the ore that will be mined.

In the summer of 1995, Codelco-Chile gained control of Chile's Renio y Briquetas SA (Rebrisa), a producer of molybdenum briquettes and rhenium at the Chuquicamata mine. Rebrisa was formed in 1989 by Codelco-Chile and was purchased by the employees.

China

China's molybdenum production has averaged 20 000 t/y in recent years. The Yang Jia Zhang Zi Mining Bureau, established in 1940, was the first molybdenum mine in China; its production has declined to 4500 t/y of roasted concentrate due to the mine's depletion of resources. Founded in 1958, Jinduicheng Molybdenum Mining Corp. (JDC) is the largest molybdenum producer in China and has extensive reserves. In 1995, JDC produced 17 600 t of molybdenum concentrate. In late 1995 and early 1996, Chinese molybdenum production was lower than usual because producers were affected by power-supply shortages caused by cold, dry weather. Production problems and increasing domestic demand resulted in lower Chinese exports for 1996. Estimated molybdenum consumption in China was 6500 t in 1993 and around 7000-7500 t in 1994. Chinese domestic consumption of molybdenum is growing rapidly and should continue to increase towards the year 2000 to an estimated 13 000-14 000 t/y.

Namibia

A feasibility study should be completed early in 1997 for the possible commercial development of the Haib project, which is a joint venture between Great Fitzroy Mines NL and Namibian Copper Mines Inc. If the project goes ahead, the companies will produce primarily copper with molybdenum and gold as by-products. Its potential production is estimated at 360 t/y of molybdenum.

Panama

Adrian Resources Ltd., a Canadian company, holds a 52% interest in the Petaquilla project, while the

remaining 48% is held by Inmet Mining Corporation. Studies of the project estimate reserves at 3900 t grading 0.015% molybdenum.

Peru

Southern Peru Copper Corporation (SPCC), owned 54% by the U.S. company ASARCO Incorporated, produced 3600 t of molybdenum in 1995, an increase of 31% from 1994, as by-product from its two copper mines: Toquepala (1700 t in 1995 vs. 1400 t in 1994) and Cuajone (1900 t in 1995 compared to 1400 t in 1994). Its 1996 production is expected to be around 4000 t.

The Canadian consortium of Rio Algom Limited and Inmet Mining Corp. won the bidding on the option to develop the Antamina prospect in Peru. The two companies formally set up a new company, Minera Antamina S.A., each with a 50% stake. Over the next two years (after the bid date of July 12, 1996), the companies will determine if they will exercise their option to move the project forward. The deposit grades 0.04% molybdenum.

United States

Cyprus Amax Minerals Company (Cyprus Amax) is the world's largest producer of molybdenum with an estimated 35% share of the global market and over 50% of the U.S. market. Cyprus Amax is probably the only company in a position to stabilize the molybdenum market. In fact, it re-opened the Climax primary molybdenum mine (dormant since 1991) near Leadville, Colorado, on April 4, 1995. On August 13, 1995, four months after re-opening, Cyprus Amax returned the Climax mine to standby status because of weak customer demand and also as a counter-measure to the weakening world molybdenum market. The Climax mine produced only 900 t of the planned 2300 t in 1995; it has a capacity of 7000 t/y.

Cyprus Amax's production totalled 25 900 t in 1994, 34 000 t in 1995 and an estimated 25 400 t in 1996. The company's primary molybdenum mine in Colorado, the Henderson mine, which is its largest producer of molybdenum, operated at full capacity in 1995 but reduced its production in 1996 to 13 200 t of its total capacity of 18 000 t/y.

At the end of 1995, Cyprus Amax sold its Climax Specialty Metals unit to a group of investors that included some of the subsidiary's management. The company was renamed CSM Inc. and is based in Cleveland, Ohio. One of its main activities is the conversion of molybdenum oxide and other raw materials to molybdenum metal.

Kennecott Corporation, which is wholly owned by RTZ-CRA Group, produced 10 750 t of molybdenum in 1995, 10 886 t in 1996, and plans to produce 9100 t in 1997 at its Bingham Canyon mine.

ASARCO Incorporated re-started its by-product molybdenum circuit at its Mission mine in Arizona at the beginning of 1995 and produced 270 t out of a total capacity of 680 t/y.

Molycorp, Inc. resumed operations at its Questa mine in New Mexico, a primary molybdenum mine with a capacity of 9000 t/y that had been shut down in 1991. Molycorp first dewatered the mine, resumed mining in the summer, and resumed operation of the concentrator in the fall of 1996. The roasting plant, located in Washington, Pennsylvania, might also resume operations, but not before 1998. Currently, three firms will roast the Questa mine's output into molybdenum oxide: Molibdenos y Metales S.A. (Molymet) of Chile, Cyprus Amax's Climax plant in Rotterdam, and Sadaci NV of Belgium.

Molybdenum oxides and hydroxides from Chile have regained U.S. duty-free GSP (Generalized System of Preferences) status. The duties have dropped to zero from the previous 3.2% most-favoured-nation rate.

International Molybdenum Association

The International Molybdenum Association was founded in 1989 by all sectors of the industry. Its activities focus on: the collection of statistics on supply, demand and inventory; health, safety and the environment; the promotion of molybdenum uses; and providing assistance to its members. Several Canadian companies are members of the association.

USES

Molybdenum and its compounds have a number of diverse uses. It is used as a pure metal, an alloy additive, a lubricant, a catalyst, and in a number of chemical compounds. In order of market share, these uses are discussed below.

Alloying Element

Molybdenum is a very versatile and cost-effective alloying element. It is added to steel and ferrous castings as molybdc oxide (MoO_3) or as ferromolybdenum (an alloy of iron and molybdenum). In this form, molybdenum is readily dissolved in molten steel with very little loss; therefore, ferromolybdenum is often used in making fine adjustments to the chemistry of batches of steel.

Metal

Molybdenum metal is the product of a rather sophisticated refining process. The metal oxide is refined to high levels of purity by precipitation from solution. The oxide powder is then reduced in hydrogen and the metal powder is compressed into billets prior to required forming operations. Molybdenum metal has

a number of valuable properties. Specifically, it has a low coefficient of thermal expansion, the refractory property of a high melting temperature, corrosion resistance, low levels of erosion from molten metal, low density, relatively high thermal conductivity, low specific heat, a high modulus of elasticity, relatively high electrical conductivity, and good electrical contact properties. It is used in such diverse end uses as glass melting electrodes, powder and spray coatings for high-wear engine parts, steel additives, disks for semi-conductors, and electrical products.

Chemical Compounds

Molybdenum is an element that is an important component of a wide variety of chemicals. These chemicals are used as lubricants, reagents, dyeing compounds, pigments, vitreous glazes and enamels, electroplating compounds, catalysts, fertilizers, flame retardants, and paints and inks.

Other Uses

Molybdenum is valued for its properties as a catalyst in the petroleum refining and chemical processing industries. Pure molybdenum disulfide is an excellent dry lubricant because it has a lamellar structure with a low coefficient of friction between the laminations and the property of bonding to other materials. Molybdenum can also be used in the production of rechargeable dry batteries. These lithium-molybdenum batteries have more power per cell volume than conventional nickel-cadmium or alkaline batteries.

PRICES

The Canadian price for contained molybdenum in concentrate averaged C\$6.35/kg in 1993, C\$11.62/kg in 1994, C\$22.27/kg in 1995, and is estimated at C\$11.64/kg for 1996.

On the world market, according to *Metals Week*, Figure 2 shows the fluctuation of prices between 1994 and 1996, in US\$ per kilogram, for molybdic oxide (MoO_3) in drums at producer price for Codelco-Chile, dealer oxide (MoO_3), and concentrate (MoS_2) obtained as a by-product.

The price of by-product molybdenum concentrate was US\$3.75/kg in January 1994 and US\$8.60/kg in December 1994. The price stayed constant at US\$8.60/kg during the first quarter of 1995 and then jumped to US\$11.02/kg in May for only two months, and finally closed the year at US\$5.51/kg. For 1996, the price was more stable and at year-end was situated at US\$4.41/kg, although it had fallen in the spring to under the US\$4.00/kg mark.

Dealer oxide prices started 1994 at US\$5.91/kg in January and reached US\$30.86/kg at year-end. In mid-January 1995, the price peaked at US\$34.17/kg and then decreased gradually to fall below the US\$10.00/kg mark at the end of July. The price remained stable in the second half of the year moving between US\$9.00 and \$10.00/kg. The price continued to fall during the first half of 1996, starting the year at US\$9.26/kg in January, reaching bottom in May at US\$6.39/kg, and then recovering to US\$9.04/kg in December.

Figure 2
Molybdenum Prices, 1994-96



Source: *Metals Week*.

¹ Molybdic oxide (MoO_3) in drums at producer price for Codelco-Chile. ² Molybdenum concentrate (MoS_2) obtained as a by-product.

Finally, Codelco-Chile drum oxide prices increased from US\$6.61/kg in January 1994 to US\$19.84/kg at year-end. Another jump brought the price to US\$44.09/kg in January 1995. It stayed at that level until August when it decreased radically to US\$13.00/kg. The price in 1996 stayed constant at US\$13.00/kg for the entire year.

OUTLOOK

Canadian molybdenum production is forecast to decrease slightly in 1997, even with the start-up of the new Huckleberry mine, as the grade of ore that will be mined will be lower at the Endako mine and at Highland Valley Copper. Over the longer term, production should remain stable unless new projects are developed and become operational, or current producers reduce or cease production. Other Canadian projects offering potential to add to the national production capacity of molybdenum include the Casino project in the Yukon; the Crow-Rea, Salal Creek and Mac properties in British Columbia; Mount Pleasant in southern New Brunswick; and a deposit located 50 km southeast of Timmins, Ontario.

Domestic consumption of molybdenum in China is growing rapidly and should continue to increase towards the year 2000 with an estimated consumption of 13 000-14 000 t/y. The growing domestic demand will directly affect China's molybdenum trade, causing a reduction in its exports to support domestic demand. While China will remain the sec-

ond largest producer of molybdenum in the world, Canada should become the third largest exporter by the end of the century, keeping its fourth-place ranking as a world producer.

In the longer term, over the next five to ten years, demand for molybdenum should continue to increase. This expectation of higher consumption is reasonable because, even at prices of US\$17-\$22/kg, molybdenum is a bargain alloying element compared to alternative elements. The expected long-term availability of molybdenum at competitive prices, in combination with its versatile performance, should result in a continuing increase in its use.

About 70% of world molybdenum is produced as a by-product or co-product of copper mining. This production is price-inelastic and is generally sold for whatever the market offers. In fact, the supply of by-product molybdenum is a function of the demand for, and price of, copper. On the other hand, future supply from primary molybdenum mines will gradually increase since many new copper discoveries contain less molybdenum. The result will be that, contrary to present figures where most of the molybdenum is produced as a by-product, primary molybdenum mines will supply the major part of the market in the longer term.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 70. (2) Information in this review was current as of February 1, 1997.

TARIFFS

Item No.	Description	Canada			United States	EU	Japan ¹
		MFN	GPT	USA	Canada	MFN	GATT
2613 2613.10	Molybdenum ores and concentrates Roasted	Free	Free	Free	1.3¢/kg on molybdenum content + 0.1%	Free	Free
2613.90	Other	Free	Free	Free	Free	Free	Free
2825.70.10 2825.70.20	Molybdenum oxides Molybdenum hydroxides	3% Free	1% Free	Free Free	Free Free	5.3% 5.3%	Free Free
28.41	Salts of oxometallic or peroxometallic acids						
2841.70	Molybdates	4%	3%	Free	Free	5.9%	3.7%
7202.70	Ferromolybdenum	8.1%	5%	Free	Free	3.6%	4.3%
8102.10	Molybdenum powders						
8102.10.10	Not alloyed	2.5%	Free	Free	Free	4.8%	2.2%
8102.10.20	Alloyed	2.5%	Free	Free	Free	4.8%	2.2%
8102.91	Unwrought molybdenum, including bars and rods obtained simply by sintering; waste and scrap						
8102.91.10	Unwrought molybdenum, not alloyed	Free	Free	Free	Free	3.8%	2.2%
8102.91.20	Unwrought molybdenum, alloyed; waste and scrap	Free	Free	Free	Free	2-3.8%	2.2%
8102.92	Bars and rods, other than those obtained simply by sintering, profiles, plates, sheets, strip and foil	5.9%	3%	Free	Free	6.2%	2.9%
8102.93	Wire						
8102.93.10	Molybdenum wire, not coated or covered	4.4%	2%	Free	Free	8%	2.9%
8102.93.20	Molybdenum wire, coated or covered	4.4%	2%	Free	Free	8%	2.9%
8102.99	Other	4%	2%	Free	Free	8.2%	2.9%

Sources: Customs Tariff, effective January 1997, Revenue Canada; Harmonized Tariff Schedule of the United States, 1997; The "Bulletin International des Douanes," Journal Number 14 (18th Edition), European Union, 1995-1996, "Conventional" column; Customs Tariff Schedules of Japan, 1996.

¹ GATT rate is shown; lower tariff rates may apply circumstantially.

TABLE 1. CANADA, MOLYBDENUM PRODUCTION AND TRADE, 1994-96, AND CONSUMPTION, 1993-1995

Item No.	1994		1995		1996P	
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
PRODUCTION (Shipments) ¹						
British Columbia	9 759	113 365	9 113	202 931	8 845	102 950
Total	9 759	113 365	9 113	202 931	8 845	102 950
EXPORTS						
2613.10 Molybdenum ores and concentrates, roasted						
Japan	3 213r	29 457r	3 215	80 968	3 168	35 826
United States	1 115	6 287	2 040	24 762	2 116	13 057
South Korea	388	3 955	142	5 012	279	3 043
Australia	98	1 042	164	5 778	222	2 764
Netherlands	366	1 751	52	448	72	653
Other countries	1 307	5 822	524	5 484	108	943
Total	6 487r	48 314r	6 137	122 452	5 965	56 286
2613.90 Molybdenum ores and concentrates, other						
Netherlands	606	2 930	50	639	1 132	4 949
Belgium	128	870	—	—	926	3 744
Japan	5	59	8	93	283	1 837
Other countries	1 644	8 945	2 803	36 176	208	1 865
Total	2 383	12 804	2 861	36 908	2 549	12 395
2825.70 Molybdenum oxides and hydroxides						
United States	—	—	24	220	—	—
India	13	170	—	—	—	—
Brazil	33	129	—	—	—	—
Total	46	299	24	220	—	—
2841.70 Metallic molybdates	—	—	—	—	—	—
7202.70 Ferromolybdenum						
United States	121	1 063	130	2 448	237	2 719
Mexico	—	—	11	7	—	—
Philippines	...	2	—	—	—	—
Total	121	1 065	141	2 455	237	2 719
8102.10 Molybdenum powders						
United States	...	30	...	4	...	14
South Korea	...	1	—	—	—	—
Total	...	31	...	4	...	14
8102.91 Molybdenum, unwrought, including bars or rods simply sintered; waste and scrap						
United States	12	196	53	1 253	22	117
Total	12	196	53	1 253	22	117
8102.92 Molybdenum bars and rods, other than those obtained simply by sintering, profiles, plates, sheets, strip and foil	—	—	—	—	—	—
8102.93 Molybdenum wire						
India	...	44	1	108	—	—
Total	...	44	1	108	—	—
8102.99 Molybdenum and articles thereof, n.e.s.						
United States	4	140r	...	4	...	3
Total	4	140r	...	4	...	3

TABLE 1 (cont'd)

Item No.	1994		1995		1996P		
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)	
IMPORTS²							
2613.10	Molybdenum ores and concentrates, roasted						
	Mexico	—	—	347	6 554	300	2 895
	United States	689	5 166	280	3 611	261	2 315
	Chile	246	2 203	64	914	203	1 861
	Belgium	378	2 620	277	3 055	88	1 003
	United Kingdom	20	188	—	—	110	891
	China	19	91	17	222	—	—
	Total	1 352	10 268	985	14 356	962	8 965
2613.90	Molybdenum ores and concentrates, n.e.s.						
	United States	435	3 753	480	7 940	18	219
	Germany	...	3	—	—	—	—
	Sweden	5	38	—	—	—	—
	Total	440	3 794	480	7 940	18	219
2825.70.10	Molybdenum oxides						
	United States	480	4 820	1 161	16 987	846	7 428
	Chile	12	114	...	4	10	101
	Mexico	—	—	15	139	4	41
	China	11	88	—	—	—	—
	Total	503	5 022	1 176	17 130	860	7 570
2825.70.20	Molybdenum hydroxides						
	United States	...	3	...	...	23	262
	United Kingdom	—	—	—	—	...	...
	Total	...	3	...	...	23	262
2841.70	Metallic molybdates						
	United States	461	2 923	379	3 488	396	3 022
	China	—	—	—	—	5	33
	United Kingdom	...	1	1	6	1	7
	Other countries	...	2	2	11	—	—
	Total	461	2 926	382	3 505	402	3 062
7202.70	Ferromolybdenum						
	Chile	528	4 198	705	11 822	540	5 576
	United States	189	1 687	358	4 966	420	3 844
	United Kingdom	39	393	60	817	157	1 529
	China	—	—	126	2 305	91	876
	Mexico	—	—	—	—	64	620
	Belgium	130	888	120	2 423	11	121
	Other countries	...	3	46	790	—	—
	Total	886	7 169	1 415	23 123	1 283	12 566
8102.10.10	Molybdenum powders, not alloyed						
	United States	6	243	8	349	5	223
	Belgium	—	—	...	5	...	5
	Germany	...	6	...	9	...	4
	France	—	—	—	—	...	1
	Total	6	249	8	363	5	233
8102.10.20	Molybdenum powders, alloyed						
	Germany	—	—	—	—	1	50
	United States	2	101	12	218	1	33
	Other countries	—	—	—	—	...	2
	Total	2	101	12	218	2	85
8102.91.10	Unwrought molybdenum, not alloyed						
	United States	...	8	7	239	8	302
	Germany	—	—	—	—	...	1
	Total	...	8	7	239	8	303

TABLE 1 (cont'd)

Item No.	1994		1995		1996p	
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
IMPORTS (cont'd)						
8102.91.20.10	Unwrought molybdenum, alloyed					
	United States					
	1	35	...	1	1	40
	Total					
	1	35	...	1	1	40
8102.91.20.20	Molybdenum, waste and scrap					
	United States					
	22	499	25	695	19	587
	Total					
	22	499	25	695	19	587
8102.92	Molybdenum bars and rods, other than those obtained simply by sintering, profiles, plates, sheets, strip and foil					
	United States					
	11	572	21	1 087	27	1 168
	Other countries					
	...	...	...	1	...	40
	Total					
	11	572	21	1 088	27	1 208
8102.93.10	Molybdenum wire, not coated or covered					
	United States					
	2	73	4	242	1	64
	Belgium					
	1	44	1	48	1	51
	Australia					
	-	-	-	-	...	4
	Total					
	3	117	5	290	2	119
8102.93.20	Molybdenum wire, coated or covered					
	United States					
	4	110	2	78	1	47
	Germany					
	-	-	-	-	...	2
	Total					
	4	110	2	78	1	49
8102.99	Molybdenum and articles thereof, other					
	United States					
	18	822	25	1 335	29	1 622
	Other countries					
	...	13	...	3	...	7
	Total					
	18	835	25	1 338	29	1 629
	1993		1994		1995p	
	(kilograms)					
CONSUMPTION³ (Mo content)						
	Carbon steel					
	603 286		531 567		580 001	
	Stainless steel					
	249 964		456 760		397 766	
	Other steel					
	680 364		813 030		713 976	
	Cast iron					
	120 385		134 975		224 899	
	Other uses ⁴					
	65 941		74 362		81 244	
	Total					
	1 719 940		2 010 694		1 997 886	

Sources: Natural Resources Canada; Statistics Canada.

- Nil; ... Amount too small to be expressed; n.e.s. Not elsewhere specified; p Preliminary; r Revised.

1 Producers' shipments (Mo content of molybdenum concentrates, molybdic oxide and ferromolybdenum). 2 Imports from "Other countries" may include re-imports from Canada. 3 Available data, as reported by consumers. 4 Nonferrous alloys, electrical, pigments and other uses.

Note: Numbers may not add to totals due to rounding.

TABLE 2. CANADA, MOLYBDENUM PRODUCTION, TRADE AND CONSUMPTION, 1975, 1980, 1985-96

	Production ¹	Exports ²	Imports		Consumption ⁸
		Molybdenum Ores and Concentrates, Oxides and Hydroxides ³	Molybdic Oxides and Hydroxides ^{4,5}	Ferro-molybdenum ^{6,7}	
(kilograms)					
1975	13 323 144	15 710 300	56 400	269 281	1 436 883
1980	11 889 000	14 584 500	361 700	53 618	1 055 107
1985	7 852 060	5 637 000	187 000	274 076	772 301
1986	11 250 625	11 367 000	203 000	347 784	684 043
1987	14 771 252	14 253 000	193 000	233 335	969 993
1988 ^a	13 535 186	14 026 855	187 691	345 664	1 213 248
1989	13 542 984	16 131 760	123 706	1 150 139	1 382 505
1990	12 188 487	11 086 429	176 481	581 780	1 179 374
1991	11 436 809	10 305 832	304 869	544 300	1 643 170
1992	8 870 267	7 138 674	249 767	493 260	1 534 941
1993	10 250 004	9 977 571	200 190	699 141	1 719 940
1994	9 758 885	8 914 141 ^r	502 529	886 303	2 010 694
1995	9 112 733	9 021 654	1 175 928	1 414 171	1 997 886
1996 ^p	8 844 560	8 511 505	884 071	1 283 132	..

Sources: Natural Resources Canada and Statistics Canada, except where noted.

.. Not available; p Preliminary; r Revised.

^a Beginning in 1988, exports and imports are based on the Harmonized System and may not be in complete accordance with previous method of reporting.

¹ Producers' shipments (Mo content of molybdenum concentrates, oxide and ferromolybdenum). ² Exports include H.S. classes 2613.10, 2613.90 and 2825.70. ³ Mo content, oxides, ores and concentrates. ⁴ Molybdic oxide includes H.S. classes 2825.70.10 and 2825.70.20. ⁵ Gross weight. ⁶ Ferromolybdenum includes H.S. class 7202.70. ⁷ For the years 1975 and 1980, U.S. exports to Canada are reported by the U.S. Bureau of Commerce, Exports of Domestic and Foreign Merchandise (Report 410), over 50% molybdenum, and for 1985-95 by Statistics Canada. ⁸ Mo content of molybdenum products reported by consumers.