

# Cadmium

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Cadmium (Cd), is a naturally occurring soft, ductile, silvery white metal that melts at 320.9°C. First discovered by Friedrich Stromeyer in Germany in 1817, cadmium owes its name to the Latin word *cadmia* meaning “calamine” (zinc carbonate,  $ZnCO_3$ ) and to the Greek word *kadmeia* with the same meaning. The most common cadmium mineral, greenockite ( $CdS$ ), is generally found in zinc-bearing ores and is recovered as a by-product during processing. Cadmium is present in the Earth’s crust in varying concentrations between 0.1 and 0.5 parts per million.

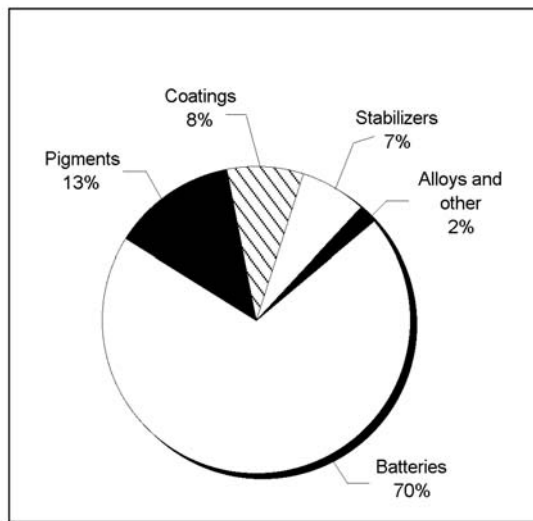
Cadmium is used principally in the production of rechargeable nickel-cadmium and silver-cadmium batteries and as a protective coating for other metals, such as electroplating iron and steel products to improve appearance and to pro-

tect against corrosion. Another important use is in the manufacture of yellow and red pigments (Figure 1).

Because cadmium is produced as a by-product of zinc mining and refining, the supply of cadmium is more dependent on zinc production than on cadmium demand. Cadmium is also produced from recycled materials such as nickel-cadmium (Ni-Cd) batteries and from some residues or intermediate products. Some 10-15% of total Western World production is from recycled materials. In December 1995, INMETCO commissioned a cadmium recovery plant at its nickel recycling facility in Elwood City, Pennsylvania. This wholly owned subsidiary of Inco Limited can process 3000 t/y of Ni-Cd batteries and is the only Ni-Cd battery recycling facility in North America.

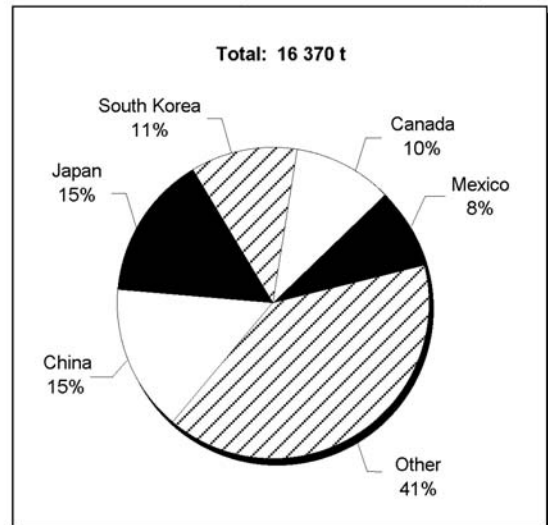
Preliminary figures indicate that Canada produced about 1634 t of refined cadmium with an estimated value of about \$1.1 million in 2003. Canada was the world’s third largest producer of cadmium in 2002, after Japan and China (Figure 2). Cadmium is produced at all four Canadian zinc plants (refer to the chapter on Zinc). About 90% of Canadian production is exported, mostly to the United States and Japan.

**Figure 1**  
**Cadmium Uses**



Source: International Cadmium Association.

**Figure 2**  
**Refined Cadmium, World Production, 2002**



Source: Natural Resources Canada.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 64. (2) Information in this review was current as of May 14, 2004. (3) This and other reviews, including previous editions, are available on the Internet at [www.nrcan.gc.ca/mms/cmy/com\\_e.html](http://www.nrcan.gc.ca/mms/cmy/com_e.html).

#### NOTE TO READERS

The intent of this document is to provide general information and to elicit discussion. It is not intended as a reference, guide or suggestion to be used in trading, investment, or other commercial activities. The author and Natural Resources Canada make no warranty of any kind with respect to the content and accept no liability, either incidental, consequential, financial or otherwise, arising from the use of this document.

#### TARIFFS

Item No.	Description	Canada			United States	EU	Japan
		MFN	GPT	USA	Canada	Conventional Rate (1)	WTO (2)
2617.90.00.10	Cadmium ores and concentrates	Free	Free	Free	Free	Free	Free
2825.90.90.10	Cadmium oxide	Free	Free	Free	Free	1.1%	Free
2830.30.00	Cadmium sulphide	Free	Free	Free	Free	5.5%	Free
8107.20.10	Unwrought cadmium; not alloyed; powders, not alloyed	Free	Free	Free	Free	3%	3%
8107.20.20	Unwrought cadmium, alloyed; powders alloyed; waste and scrap, alloyed	Free	Free	Free	Free	Free-3%	3%
8107.90	Cadmium and articles thereof, n.e.s.	3%	Free	Free	Free	4%	3%

Sources: Canadian *Customs Tariff*, effective January 2004, Canada Border Services Agency; *Harmonized Tariff Schedule of the United States*, 2004; *Official Journal of the European Union* (October 30, 2003 Edition); *Customs Tariff Schedules of Japan*, 2003.

n.e.s. Not elsewhere specified.

(1) The customs duties applicable to imported goods originating in countries that are Contracting Parties to the General Agreement on Tariffs and Trade or with which the European Community has concluded agreements containing the most-favoured-nation tariff clause shall be the conventional duties shown in column 3 of the Schedule of Duties. (2) WTO rate is shown; lower tariff rates may apply circumstantially.

**TABLE 1. CANADA, CADMIUM PRODUCTION, IMPORTS AND EXPORTS, 2001-03, AND USE, 2000-2002**

Item No.	2001		2002		2003	
	(kg)	(\$000)	(kg)	(\$000)	(kg)	(\$000)
<b>PRODUCTION (All Forms) (1)</b>						
New Brunswick	191 967	146	132 790	134	137 066	261
Quebec	283 059	215	277 390	280	288 553	549
Ontario	411 250	313	488 715	493	284 730	542
British Columbia	92 288	70	—	—	—	—
Total	978 564	744	898 895	907	710 349	1 351
Refined (2)	1 492 683	...	1 706 223	...	1 633 869	...
<b>EXPORTS</b>						
8107.10	Unwrought cadmium; waste and scrap; powders, not alloyed					
Belgium	358 799	241	—	—	—	—
China	42 377	59	—	—	—	—
France	35	34	—	—	—	—
Hong Kong	16 971	58	—	—	—	—
India	109 380	393	—	—	—	—
Israel	93	97	—	—	—	—
Japan	281 829	346	—	—	—	—
United Kingdom	126 986	165	—	—	—	—
United States	7 028	1 701	—	—	—	—
Total	943 498	3 094	—	—	—	—
8107.20	Unwrought cadmium; powders, alloyed					
Belgium	—	—	346 365	268	—	—
China	—	—	228 951	139	—	—
Israel	—	—	23	8	—	—
Japan	—	—	511 584	737	—	—
United Kingdom	—	—	42 349	38	—	—
United States	—	—	6 825	799	—	—
Total	—	—	1 136 097	1 989	—	—
8107.90	Cadmium and articles thereof, n.e.s.					
United States	6 159	835	8 264	1 489	1 529	478
Belgium	412 058	269	375 721	264	330 425	399
Germany	—	—	—	—	5 288	19
India	37 299	82	—	—	—	—
Israel	25	9	—	—	—	—
China	—	—	79 456	48	—	—
France	—	—	12 800	39	—	—
Total	455 541	1 195	476 241	1 840	337 242	896
Total exports	1 399 039	4 289	1 612 338	3 829	337 242	896
<b>IMPORTS</b>						
2617.90.00.10	Cadmium ores and concentrates					
United States	9	—	84	1	122	1
2825.90.90.10	Cadmium oxide					
Belgium	190	4	247	5	358	8
United States	1 056	24	243	5	284	6
United Kingdom	178	4	163	4	—	—
Total	1 424	32	653	14	642	14

TABLE 1 (cont'd)

Item No.	2001		2002		2003		
	(kg)	(\$000)	(kg)	(\$000)	(kg)	(\$000)	
<b>IMPORTS (cont'd)</b>							
2830.30	Cadmium sulphide						
	United States	241	–	2 137	1	1 386	1
	Australia	–	–	545	–	–	–
	Mexico	–	–	53 422	21	–	–
	Total	241	–	56 104	22	1 386	1
8107.10.00.10	Unwrought cadmium, not alloyed; powders, not alloyed						
	Japan	11	–	–	–	–	–
	United States	336	9	–	–	–	–
	Total	347	9	–	–	–	–
8107.10.00.20	Unwrought cadmium, alloyed; powders, alloyed						
	Switzerland	5	–	–	–	–	–
8107.10.00.30	Cadmium waste and scrap						
	United States	80	2	–	–	–	–
8107.20.00.10	Unwrought cadmium, not alloyed; powders, not alloyed						
	United States	–	–	37	1	458	11
	Germany	–	–	–	–	115	2
	Japan	–	–	86	2	5	–
	Total	–	–	123	3	578	13
8107.20.00.20	Unwrought cadmium, alloyed; powders, alloyed						
	United States	–	–	37	1	459	11
	Germany	–	–	–	–	129	2
	Japan	–	–	86	2	5	–
	Total	–	–	123	3	593	13
8107.30	Cadmium waste and scrap						
	Russia	–	–	–	–	588	11
	United States	–	–	604	17	1	–
	Total	–	–	604	17	589	11
8107.90	Cadmium and articles thereof, n.e.s.						
	United States	19 938	439	33 179	790	11 170	324
	Mexico	33	1	50	1	48	2
	Belgium	38	1	–	–	–	–
	Germany	23	1	23	1	–	–
	United Kingdom	189	4	64	2	–	–
	China	–	–	1 015	28	–	–
	India	–	–	13	–	–	–
	Total	20 221	446	34 344	822	11 218	326
	Total imports	22 327	489	92 035	882	15 128	379

**TABLE 1 (cont'd)**

	2000	2001	2002
	(kg)		
<b>QUANTITY USED</b>			
Cadmium metal (3)			
Plating	3 545	x	x
Solders, other alloys and uses (4)	168 759	x	x
Total	172 304	212 969	209 434

Sources: Natural Resources Canada; Statistics Canada.

– Nil; . . . Amount too small to be expressed; (p) Preliminary; x Confidential.

(a) Increase in number of companies being surveyed.

(1) Production includes recoverable content of cadmium in the zinc-lead concentrates shipped. (2) Refined metal produced from domestic and foreign ores and recycled materials. (3) Available data as reported by consumers. (4) Chemicals and pigments.

Notes: The number 8107.10.00.30 was changed to 8107.30 in 2002. Numbers may not add to totals due to rounding.

**TABLE 2. WORLD PRODUCTION OF CADMIUM, 1997-2002**

Country	1997	1998	1999	2000	2001	2002
	(tonnes)					
Algeria	36.0	13.0	–	–	–	–
Argentina	130.0	130.0	–	–	–	–
Australia	632.0	585.0	462.0	525.0	378.0	378.0
Belgium	1 420.0	1 318.4	1 234.9	1 147.8	1 235.9	116.8
Brazil	2 260.2	2 090.1	1 910.5	1 940.9	1 492.7	1 663.9
Bulgaria	183.0	195.0	217.0	233.0	234.0	252.0
Canada	1 223.2	1 274.0	1 274.7	1 268.0	1 421.0	1 382.0
China	1 982.0	2 125.0	2 154.0	2 368.0	2 507.0	2 507.0
Finland	494.0	520.0	696.0	683.0	604.0	4.0
France	309.0	177.0	195.3	160.1	175.8	153.7
Germany	729.1	616.8	703.2	457.8	538.9	422.1
India	296.0	295.0	278.0	315.0	437.0	466.0
Italy	287.0	328.0	360.0	284.0	312.7	390.6
Japan	2 473.0	2 337.0	2 567.0	2 472.0	2 460.0	2 444.0
Kazakhstan	745.0	1 463.0	1 061.0	257.0	170.0	478.7
Macedonia	10.0	10.0	236.1	335.1	73.0	111.2
Mexico	359.0	405.0	466.0	483.0	456.0	422.0
Namibia	2.0	–	–	–	–	–
Netherlands	718.0	739.0	731.0	628.0	455.0	485.0
North Korea	200.0	200.0	200.0	200.0	200.0	200.0
Norway	305.0	276.0	244.0	302.0	367.0	208.6
Peru	2 059.0	1 240.0	1 185.0	1 890.0	680.0	700.0
Poland	22.0	–	–	6.0	330.0	440.0
Russia	790.0	800.0	900.0	925.0	925.0	925.0
Serbia and Montenegro	45.0	17.0	5.0	–	–	–
South Korea	1 000.0	1 178.0	1 791.0	1 911.0	1 879.0	1 827.0
Spain	301.0	196.0	–	–	–	–
Thailand	238.0	–	–	–	–	–
Turkey	89.0	69.0	64.0	–	–	–
United Kingdom	455.0	440.0	547.0	503.0	425.0	292.3
United States	6 076.4	5 174.0	4 836.2	5 581.9	4 083.7	4 167.9
Uzbekistan	100.0	100.0	100.0	100.0	100.0	100.0
Total world	19 937.5	19 172.2	19 582.7	19 394.7	17 891.0	16 369.9

Sources: Natural Resources Canada; International Consultative Group on Nonferrous Metal Statistics.

– Nil.

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

**TABLE 3. WORLD USE OF CADMIUM, 1997-2002**

Country	1997	1998	1999	2000	2001	2002
	(tonnes)					
Argentina	45.0	34.0	21.0	12.0	12.0	..
Australia	24.0	24.0	24.0	24.0	24.0	24.0
Belgium	2 020.0	3 217.0	4 065.0	3 559.0	4 425.7	4 755.0
Brazil	100.0	100.0	12.0	12.0	15.0	37.0
Canada	139.3	198.7	156.8	159.4	189.6	200.9
China	600.0	2 409.0	2 866.0	4 854.0	5 268.0	5 407.0
Czech Republic	60.0	60.0	3.1	0.7	0.3	0.1
France	1 809.0	1 800.0	1 800.0	1 000.0	305.9	240.9
Germany	750.0	750.0	657.7	412.4	592.9	499.1
India	446.4	446.4	446.4	446.4	446.4	446.4
Italy	100.0	220.0	260.0	204.0	200.0	200.0
Japan	7 247.0	5 795.2	5 851.4	6 809.8	4 649.5	5 371.5
Mexico	140.4	140.4	140.4	140.4	140.4	140.4
Poland	35.0	10.0	5.8	7.0	135.0	391.5
Russia	800.0	1 136.0	1 260.0	816.0	308.0	345.0
Serbia and Montenegro	30.0	30.0	30.0	30.0	30.0	30.0
South Africa	20.4	20.4	20.4	20.4	20.4	20.4
South Korea	380.4	380.4	380.4	380.4	200.2	123.1
Sweden	300.0	248.0	284.0	26.0	60.0	113.0
Taiwan	20.4	20.4	20.4	20.4	20.4	20.4
United Kingdom	631.2	626.1	631.3	584.8	583.7	588.7
United States	2 506.0	2 030.0	1 850.0	2 010.0	679.0	560.0
Other	185.8	196.8	209.8	218.8	218.8	230.8
Total world	18 390.3	19 892.8	20 995.9	21 747.9	18 525.2	19 745.2

Sources: Natural Resources Canada; International Consultative Group on Nonferrous Metal Statistics.

.. Not available.