

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.

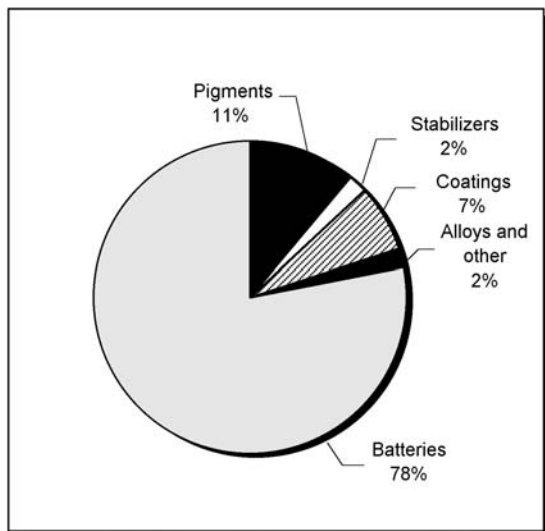
Cadmium is used principally in the production of rechargeable nickel-cadmium and silver-cadmium batteries and as a protective coating for other metals such as electroplating iron and steel products to improve appear-

ance and to protect 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.

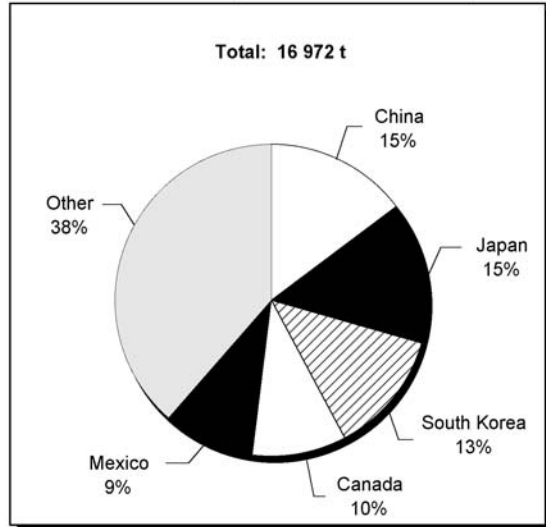
In 2004, preliminary figures indicate that Canada produced about 1888 t of refined cadmium. Canada was the world's fourth largest producer of cadmium in 2003 after China, Japan and South Korea (Figure 2). Cadmium is produced at all four Canadian zinc plants (refer to the chapter on zinc). About 90% of Canadian production is exported, mostly to the United States and Japan.

Figure 1
Cadmium Uses, 2003



Source: International Cadmium Association.

Figure 2
Refined Cadmium, World Production, 2003



Source: International Consultative Group on Nonferrous Metals Statistics.

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 31, 2005. (3) This and other reviews, including previous editions, are available on the Internet at www.nrcan.gc.ca/mms/cmy/com_e.html.

NOTE TO READERS

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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
8107.00	Cadmium and articles thereof, including waste and scrap						
8107.20.00	Unwrought cadmium; powders	Free	Free	Free	Free	3%	3%
8107.30.00	Waste and scrap	Free	Free	Free	Free	Free	3%
8107.90.00	Other	3%	Free	Free	Free	4%	3%

Sources: Canadian Customs Tariff, effective January 2005, Canada Border Services Agency; Harmonized Tariff Schedule of the United States, 2005; Official Journal of the European Union (October 30, 2004 Edition); Customs Tariff Schedules of Japan, 2004.

(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 AND TRADE, 2002-04, AND USE, 2001-03

Item No.	2002		2003		2004	
	(kg)	(\$000)	(kg)	(\$000)	(kg)	(\$000)
PRODUCTION (All Forms) (1)						
New Brunswick	132 790	134	134 339	244	99 866	154
Quebec	277 390	280	324 919	589	295 465	454
Ontario	488 715	493	256 533	465	303 427	467
Total	898 895	907	715 791	1 298	698 758	1 075
Refined (2)	1 706 223	...	1 759 623	...	1 888 143	...
EXPORTS						
2830.30	Cadmium sulphide					
Japan	-	-	-	-	12 000	7
8107.20	Unwrought cadmium; powders					
Japan	511 584	737	484 141	1 057	619 751	932
Belgium	346 365	268	648 122	1 013	477 502	930
Sweden	-	-	39 974	92	240 775	436
United States	6 825	799	25 490	588	16 862	396
United Kingdom	42 349	38	126 944	113	121 144	185
Philippines	-	-	-	-	59 940	112
India	-	-	-	-	39 960	76
France	-	-	104	115	32 755	69
Switzerland	-	-	6 544	10	39 960	67
Israel	23	8	290	97	4 019	38
China	228 951	139	40 664	25	-	-
Total	1 136 097	1 989	1 372 273	3 110	1 652 668	3 241
8107.90	Cadmium and articles thereof, n.e.s.					
Belgium	375 721	264	330 425	399	299 387	339
United States	8 264	1 489	1 529	478	74	37
China	79 456	48	-	-	19 616	22
France	12 800	39	-	-	-	-
Germany	-	-	5 288	19	-	-
Total	476 241	1 840	337 242	896	319 077	398
Total exports	1 612 338	3 829	1 709 515	4 006	1 983 745	3 646
IMPORTS						
2617.90.00.10	Cadmium ores and concentrates					
United States	84	1	122	1	19	...
2825.90.90.10	Cadmium oxide					
United States	243	5	284	6	2 045	44
Belgium	247	5	358	8	442	9
United Kingdom	163	4	-	-	-	-
Total	653	14	642	14	2 487	53
2830.30	Cadmium sulphide					
United States	2 137	1	1 386	1	1 512	1
Australia	545	...	-	-	-	-
Mexico	53 422	21	-	-	-	-
Total	56 104	22	1 386	1	1 512	1

TABLE 1 (cont'd)

Item No.	2002		2003		2004		
	(kg)	(\$000)	(kg)	(\$000)	(kg)	(\$000)	
IMPORTS (cont'd)							
8107.10.00.10	Unwrought cadmium, not alloyed; powders, not alloyed						
	United States	37	1	458	11	448	12
	Peru	-	-	-	-	357	10
	Japan	86	2	5	...	3	...
	Germany	-	-	115	2	-	-
	United Kingdom	-	-	7	...	-	-
	Total	123	3	585	13	808	22
8107.10.00.20	Unwrought cadmium, alloyed; powders, alloyed						
	United States	37	1	459	11	449	12
	Peru	-	-	-	-	357	10
	Japan	86	2	5	...	3	...
	Germany	-	-	129	2	-	-
	United Kingdom	-	-	7	...	-	-
	Total	123	3	600	13	809	22
8107.10.00.30	Cadmium waste and scrap						
	United States	604	17	1	...	192	5
	Russia	-	-	588	11	-	-
	Total	604	17	589	11	192	5
8107.90	Cadmium and articles thereof, n.e.s.						
	United States	33 173	790	11 170	324	20 343	580
	Canada	-	-	-	-	874	6
	Mexico	50	1	48	2	294	5
	Belgium	-	-	-	-	408	3
	Germany	23	1	-	-	6	...
	China	1 015	28	-	-	-	-
	India	13	...	-	-	-	-
	United Kingdom	64	2	-	-	-	-
	Total	34 338	822	11 218	326	21 925	594
	Total imports	92 029	882	15 142	379	27 752	697
				2001	2002	2003	
				(kg)			
QUANTITY USED							
	Cadmium metal (3)						
	Plating		x		x		x
	Solders, other alloys and uses (4)		x		x		x
	Total	212 969		209 434		209 935	

Sources: Natural Resources Canada; Statistics Canada.

- Nil; ... Amount too small to be expressed; x Confidential.

(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.

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

TABLE 2. WORLD PRODUCTION OF CADMIUM, 1998-2003

Country	1998	1999	2000	2001	2002	2003
	(tonnes)					
Algeria	13.0	–	–	–	–	–
Argentina	34.0	–	–	34.0	–	25.0
Australia	585.0	462.0	525.0	416.0	524.0	683.0
Belgium	1 318.4	1 234.9	1 147.8	1 235.9	116.8	–
Brazil	125.0	130.0	135.0	140.0	170.0	180.0
Bulgaria	195.0	317.0	331.0	333.0	345.0	307.0
Canada	2 090.1	1 910.5	1 940.9	1 492.7	1 706.2	1 759.6
China	2 125.0	2 154.0	2 368.0	2 507.0	2 441.0	2 500.0
Finland	520.0	696.0	683.0	604.0	4.0	–
France	177.0	195.3	160.1	175.8	153.7	–
Germany	616.8	703.2	457.8	538.9	422.1	640.0
India	295.0	278.0	315.0	437.0	466.0	477.0
Italy	328.0	360.0	284.0	312.7	390.6	22.0
Japan	2 337.0	2 567.0	2 472.0	2 460.0	2 444.0	2 497.0
Kazakhstan	1 463.0	1 061.0	257.0	170.0	478.7	795.0
Macedonia	10.0	236.1	335.1	73.0	111.2	75.0
Mexico	1 274.9	1 274.7	1 268.0	1 421.0	1 382.0	1 590.0
Netherlands	739.0	731.0	628.0	455.0	485.0	495.0
North Korea	200.0	200.0	200.0	200.0	200.0	200.0
Norway	276.0	211.0	298.0	372.0	208.6	331.0
Peru	405.0	466.0	483.0	473.0	422.0	529.0
Poland	–	–	6.0	330.0	440.0	375.0
Russia	800.0	900.0	780.0	62.0	650.0	650.0
Serbia and Montenegro	17.0	5.0	–	–	–	–
South Korea	1 178.0	1 811.0	1 902.0	1 879.0	1 825.0	2 175.0
Spain	196.0	–	–	–	–	–
Turkey	69.0	64.0	–	–	–	–
United Kingdom	440.0	547.0	503.0	425.0	292.3	22.0
United States	1 240.0	1 185.0	1 890.0	680.0	700.0	670.0
Uzbekistan	100.0	100.0	100.0	100.0	100.0	100.0
Total world	19 167.2	19 799.7	19 469.7	17 885.0	16 478.2	17 097.6

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

– Nil.

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