Cadmium

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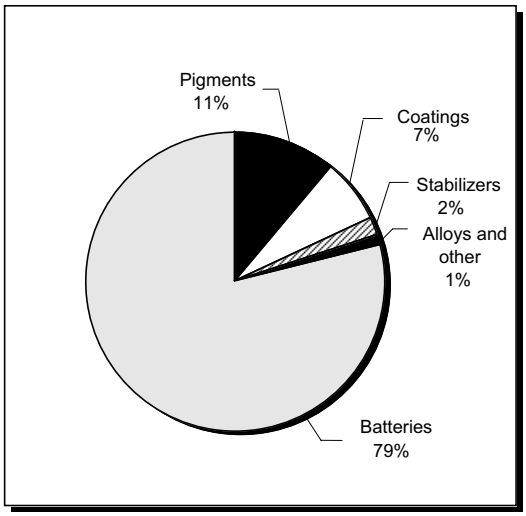
Cadmium (Cd), is a naturally occurring soft, ductile, silvery white metal that melts at 320.9°C. First discovered by Friedrich Stromeyer in Germany in 1817, cadmium owes its name to the Latin word *cadmia* meaning "calamine" (zinc carbonate, $ZnCO_3$) and from the Greek word *kadmeia* with the same meaning. 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 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 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.

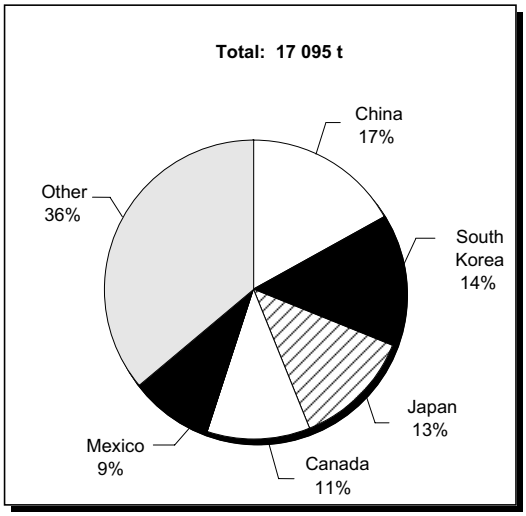
In 2005, preliminary figures indicate that Canada produced about 1703 t of refined cadmium. Canada was the world's fourth-largest producer of cadmium in 2004 after China, South Korea and Japan (Figure 2). Cadmium is produced at all four Canadian zinc plants (see chapter on zinc). About 90% of Canadian production is exported, mostly to the United States and Japan.

Figure 1
Cadmium Uses, 2004



Source: International Cadmium Association.

Figure 2
Refined Cadmium, World Production, 2004



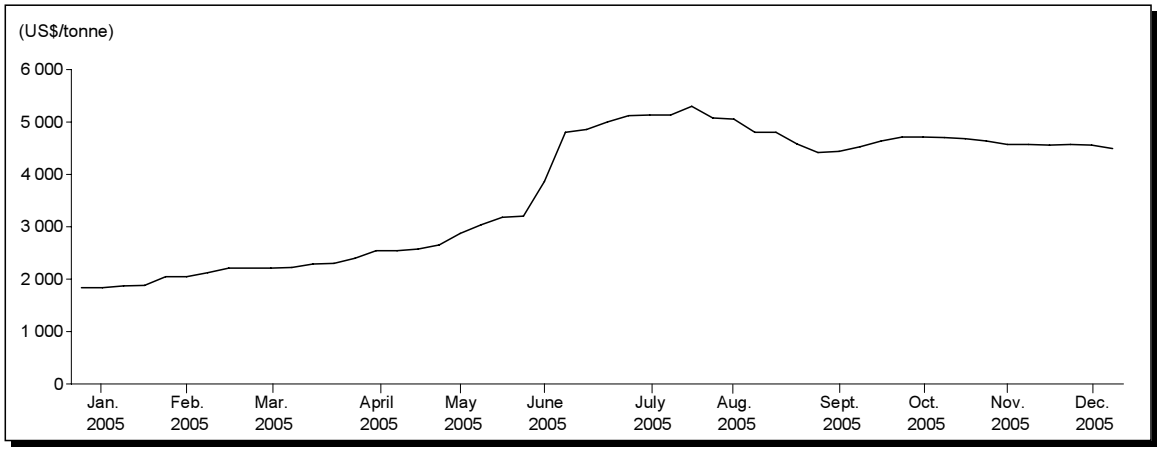
Source: International Consultative Group on Nonferrous Metals Statistics.

Cadmium prices rose sharply in the first half of the year from just under US$2000/t to over US$5000/t in July before falling back to about US$4500/t toward the end of the year (Figure 3). Cadmium prices averaged just under US$3700/t in 2005, up considerably from the US$1427/t average set in 2004. A surge in demand from the Asian battery market, combined with tight supplies, contributed to the sharp increase in prices.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 65. (2) Information in this review was current as of January 31, 2006. (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

Figure 3
Weekly Mean Cadmium Prices (99.99%) Prices, 2005



Source: Metal Prices.com

TARIFFS

Item No.	Description	Canada MFN	Canada GPT	Canada USA	United States Canada	EU Conventional Rate (1)	Japan WTO (2)
2617.90.00.10	Other ores and concentrates: other: cadmium	Free	Free	Free	Free	Free	Free
2825.90.90.10	Hydrazine and hydroxylamine and their inorganic salt; other inorganic bases; other metal oxides, hydroxides and peroxides: other: cadmium oxide	Free	Free	Free	Free	Free-5.5%	Free
2830.30.00	Sulphides; polysulphides, whether or not chemically defined: cadmium sulphide	Free	Free	Free	Free	5.5%	Free
81.07	Cadmium and articles thereof, including waste and scrap	Free-3%	Free	Free	Free	Free-4%	3%
8107.20.00.10	Unwrought cadmium; powders: not alloyed	Free	Free	Free	Free	3%	3%
8107.20.00.20	Unwrought cadmium; powders: alloyed	Free	Free	Free	Free	3%	3%
8107.30	Waste and scrap	Free	Free	Free	Free	Free	3%
8107.90	Other	3%	Free	Free	4.4%	4%	3%

Sources: Canadian *Customs Tariff*, effective January 2006, Canada Border Services Agency; *Harmonized Tariff Schedule of the United States,* 2006; *Official Journal of the European Union* (October 27, 2005 Edition); *Customs Tariff Schedules of Japan, 2006*.
(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, 2003-05

	2003		2004		2005 (p)	
	(kg)	($000)	(kg)	($000)	(kg)	($000)
PRODUCTION (All Forms) (1)						
New Brunswick	134 339	244	101 464	159	233 478	895
Quebec	324 919	589	401 769	630	149 569	573
Ontario	256 533	465	236 400	370	205 000	786
Total	715 791	1 298	739 633	1 159	588 047	2 254
Refined (2)	1 759 263	. . .	1 880 147	. . .	1 703 070	. . .

Sources: Natural Resources Canada; Statistics Canada.
. . . Amount too small to be expressed; (p) Preliminary.
(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.
Note: Numbers may not add to totals due to rounding.

TABLE 2. CANADA, CADMIUM TRADE, 2003-05

Item No.		2003		2004		2005 (p)	
		(kg)	($000)	(kg)	($000)	(kg)	($000)
EXPORTS							
2830.30	Cadmium sulphide						
	Japan	–	–	12 000	7	–	–
8107.20	Unwrought cadmium; powders						
	Belgium	648 122	1 013	477 502	930	602 599	1 339
	Japan	484 141	1 057	619 751	932	528 416	1 133
	Philippines	–	–	59 940	112	733 661	367
	United States	25 490	588	16 862	396	37 312	286
	China	40 664	25	–	–	34 721	188
	Malaysia	–	–	–	–	104 407	139
	France	104	115	32 755	69	12 165	93
	Israel	290	97	4 019	38	42 191	76
	South Korea	–	–	–	–	68 467	74
	Hong Kong	–	–	–	–	19 980	69
	Germany	–	–	–	–	3 693	28
	United Kingdom	126 944	113	121 144	185	19 000	21
	Sweden	39 974	92	240 775	436	–	–
	Switzerland	6 544	10	39 960	67	–	–
	India	–	–	39 960	76	–	–
	Total	1 372 273	3 110	1 652 668	3 241	2 206 612	3 813
8107.90	Cadmium and articles thereof, n.e.s.						
	United States	1 529	478	74	37	4 056	917
	China	–	–	19 616	22	91 205	216
	Belgium	330 425	399	299 387	339	122 713	128
	Australia	–	–	–	–	27 503	83
	Germany	5 288	19	–	–	–	–
	Total	337 242	896	319 077	398	245 477	1 344
	Total exports	1 709 515	4 006	1 983 745	3 646	2 452 089	5 157
IMPORTS							
2617.90.00.10	Cadmium ores and concentrates						
	United States	122	1	19	. . .	–	–
2825.90.90.10	Cadmium oxide						
	United States	284	6	2 045	44	1 153	25
	Belgium	358	8	442	9	728	16
	Total	642	14	2 487	53	1 881	41
2830.30	Cadmium sulphide						
	United States	1 386	1	1 512	1	96 944	48
	China	–	–	–	–	3 590	2
	Germany	–	–	–	–	52	. . .
	Total	1 386	1	1 512	1	100 586	50

TABLE 2 (cont'd)

Item No.		2003		2004		2005 (p)	
		(kg)	($000)	(kg)	($000)	(kg)	($000)
IMPORTS (cont'd)							
8107.20.00.10	Unwrought cadmium, not alloyed; powders, not alloyed						
	Macedonia (FYROM)	–	–	–	–	766	21
	South Korea	–	–	–	–	706	19
	United States	458	11	448	12	439	12
	Other countries	127	2	360	10	448	12
	Total	585	13	808	22	2 359	64
8107.20.00.20	Unwrought cadmium, alloyed; powders, alloyed						
	United States	1	. . .	1	. . .	153	4
	Germany	14	. . .	–	–	8	. . .
	Total	15	. . .	1	. . .	161	4
8107.30	Cadmium waste and scrap						
	United States	1	. . .	192	5	22	1
	Russia	588	11	–	–	–	–
	Total	589	11	192	5	22	1
8107.90	Cadmium and articles thereof, n.e.s.						
	United States	–	–	408	3	12 199	332
	Canada	11 170	324	20 343	580	8 292	254
	Mexico	48	2	1 174	11	3644	101
	Total	11 218	326	21 925	594	24 135	687
	Total imports	14 557	366	26 944	675	129 144	847

Sources: Natural Resources Canada; Statistics Canada.
– Nil; . . . Amount too small to be expressed; n.e.s. Not elsewhere specified; (p) Preliminary
Note: Numbers may not add to totals due to rounding.

TABLE 3. CANADA, CADMIUM USE, 2001-04

	2001	2002	2003	2004
			(kilograms)	
Cadmium metal (used) (1)				
Plating	x	x	x	x
Solders, other alloys and uses (2)	x	x	x	x
Total	212 969	209 434	209 925	210 101

Source: Natural Resources Canada.
x Confidential.
(1) Available data reported by users. (2) Includes chemicals.
Note: Numbers may not add to totals due to rounding.

TABLE 4. CANADA, CADMIUM PRODUCTION AND EXPORTS, 1988-2004

Year	Production All Forms (1)	Production Refined (2)	Exports of Cadmium Metal
		(kilograms)	
1988	1 663 978	1 693 708	1 144 994
1989	1 710 527	1 619 798	1 433 144
1990	1 333 664	1 470 229	1 282 603
1991	1 549 087	1 829 059	1 452 630
1992	1 393 099	1 962 813	1 579 823
1993	1 161 173	1 888 255	1 856 940
1994	1 499 996	2 173 018	1 903 371
1995	1 686 439	2 349 256	2 462 798
1996	1 540 072	2 432 681	1 693 120
1997	1 272 172	2 260 172	2 538 816
1998	1 179 427	2 090 052	2 049 517
1999	1 114 921	1 910 527	2 169 553
2000	934 084	1 940 917	2 059 898
2001	978 564	1 492 683	1 399 039
2002	898 895	1 706 223	1 612 338
2003	715 791	1 759 263	1 709 515
2004	739 633	1 880 147	1 983 745

Sources: Natural Resources Canada; Statistics Canada.
(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.
Note: Numbers may not add to totals due to rounding.

TABLE 5. WORLD PRODUCTION OF CADMIUM, 1999-2004

Country	1999	2000	2001	2002	2003	2004
			(tonnes)			
Argentina	–	–	34.0	–	25.0	39.0
Australia	462.0	525.0	416.0	524.0	673.0	469.0
Belgium	1 234.9	1 147.8	1 235.9	116.8	–	–
Brazil	130.0	135.0	140.0	170.0	180.0	180.0
Bulgaria	317.0	331.0	333.0	345.0	307.0	356.0
Canada	1 910.5	1 940.9	1 492.7	1 706.2	1 759.0	1 888.0
China	2 154.0	2 368.0	2 467.0	2 426.0	2 705.0	2 900.0
Finland	696.0	683.0	604.0	4.0	–	–
France	195.3	160.1	175.8	153.7	120.0	120.0
Germany	703.2	457.8	538.9	422.1	640.0	640.0
India	278.0	315.0	437.0	466.0	477.0	489.0
Italy	360.0	284.0	312.7	390.6	22.0	–
Japan	2 567.0	2 472.0	2 460.0	2 444.0	2 497.0	2 233.0
Kazakhstan	1 061.0	257.0	170.0	478.7	795.0	800.0
Macedonia	236.1	335.1	73.0	111.2	75.0	–
Mexico	1 274.7	1 268.0	1 421.0	1 382.0	1 638.0	1 618.0
Netherlands	731.0	628.0	455.0	485.0	495.0	572.0
North Korea	200.0	200.0	200.0	200.0	200.0	200.0
Norway	211.0	298.0	372.0	208.6	331.0	141.0
Peru	466.0	483.0	473.0	422.0	529.0	532.0
Poland	–	6.0	330.0	440.0	375.0	356.0
Russia	900.0	780.0	620.0	650.0	650.0	650.0
Serbia and Montenegro	5.0	–	–	–	–	–
South Korea	1 811.0	1 902.0	1 879.0	1 825.0	2 175.0	2 362.0
Turkey	64.0	–	–	–	–	–
United Kingdom	547.0	503.0	425.0	292.3	22.0	–
United States	1 185.0	1 890.0	680.0	700.0	670.0	550.0
Uzbekistan	100.0	–	–	–	–	–
Total world	19 799.7	19 369.7	17 745.0	16 363.2	17 360.0	17 095.0

Sources: Natural Resources Canada; International Consultative Group on Nonferrous Metals Statistics.
– Nil.
Note: Numbers may not add to totals due to rounding