

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 ppm.

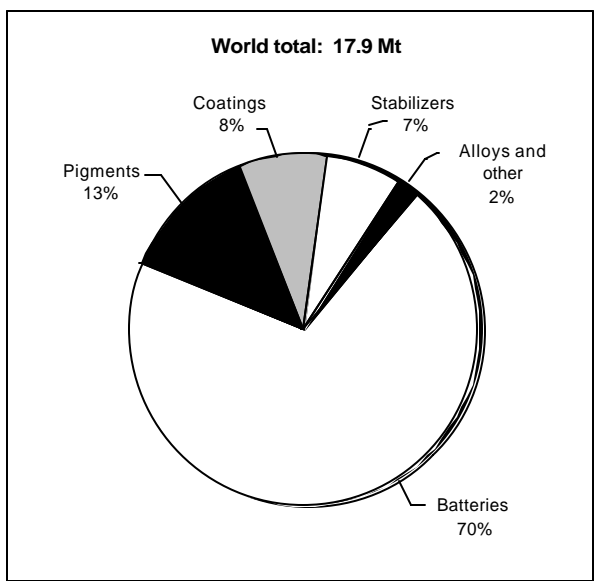
Cadmium is used principally in the production of rechargeable nickel-cadmium and silver-cadmium batteries and as a protective coating for other metals,

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 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.

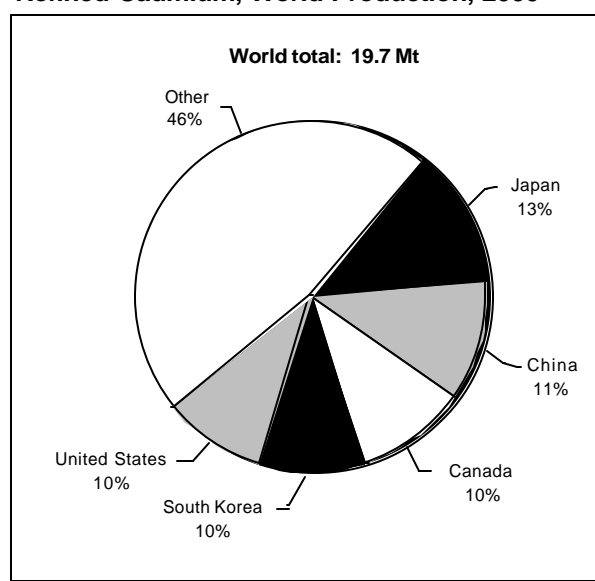
In 2001, preliminary figures indicate that Canada produced about 1429 t of refined cadmium with an

Figure 1
Cadmium Uses



Source: International Cadmium Association.

Figure 2
Refined Cadmium, World Production, 2000



Source: Natural Resources Canada.

estimated value of over \$0.8 million. Canada was the world's third largest producer of cadmium in 2000, after Japan and China (Figure 2). Cadmium is produced at all four Canadian zinc plants (refer to the Zinc chapter). About 90% of Canadian cadmium production is exported, mostly to the United States and Japan.

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 17, 2002. (3) This and other reviews, including previous editions, are available on the Internet at www.nrcan.gc.ca/mms/cmy/index_e.html.

NOTE TO READERS

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TARIFFS

Item No.	Description	Canada			United States	EU	Japan (1)
		MFN	GPT	USA	Canada	MFN	WTO
2617.90.00.10	Cadmium ores and concentrates	Free	Free	Free	Free	Free	Free
2825.90.90.10	Cadmium oxide	Free	Free	Free	Free	3.3%	Free
2830.3	Cadmium sulphide	Free	Free	Free	Free	5.5%	Free
8107.20.10	Unwrought cadmium, not alloyed; powders, not alloyed	Free	Free	Free	Free	3.0%	3%
8107.20.20	Unwrought cadmium, alloyed; waste and scrap; powders, alloyed	Free	Free	Free	Free	Free-3%	3%
8107.9	Cadmium and articles thereof, n.e.s.	3%	Free	Free	Free	4.0%	3%

Sources: *Customs Tariff*, effective January 2002, Canada Customs and Revenue Agency; *Harmonized Tariff Schedule of the United States*, 2002; *Worldtariff Guidebook on Customs Tariff Schedules of Import Duties for European Union* (41st Annual Edition: 2001); *Custom Tariff Schedules of Import Duties for Japan* (35th Annual Edition: 2001).

n.e.s. Not elsewhere specified.

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

TABLE 1. CANADA, CADMIUM PRODUCTION, IMPORTS AND EXPORTS, 1999-2001, AND USE, 1998-2000

Item No.	1999		2000		2001 (p)	
	(kg)	(\$000)	(kg)	(\$000)	(kg)	(\$000)
PRODUCTION (all forms) (1)						
New Brunswick	250 419	145	169 710	91	211 478	160
Quebec	336 674	195	223 068	120	280 375	212
Ontario	375 789	218	381 000	204	474 000	359
British Columbia	152 039	88	160 306	86	92 287	70
Total	1 114 921	647	934 084	501	1 058 140	801
Refined (2)	1 910 527	...	1 940 917	...	1 429 132	...
EXPORTS						
8107.10	Unwrought cadmium; waste and scrap; powders					
United States	98 185	688	40 218	1 419	7 028	1 701
India	-	-	-	-	109 380	393
Japan	337 644	332	627 840	399	281 829	346
Belgium	867 254	869	694 640	438	358 799	241
United Kingdom	189 171	96	200 354	129	126 986	165
Israel	3 077	70	24	13	93	97
China	-	-	-	-	42 377	59
Hong Kong	-	-	-	-	16 971	58
France	2 500	37	32	38	35	34
Total	1 497 831	2 092	1 563 108	2 436	943 498	3 094
8107.90	Cadmium and articles thereof, including waste and scrap					
United States	86 460	123	-	-	6 159	835
Belgium	483 350	322	478 728	245	412 058	269
India	21 753	18	-	-	37 299	82
Israel	-	-	49	27	25	9
Netherlands	13 870	9	-	-	-	-
Japan	66 289	80	-	-	-	-
France	-	-	13	15	-	-
Hong Kong	-	-	18 000	109	-	-
Total	671 722	552	496 790	396	455 541	1 195
IMPORTS						
2617.90.00.10	Cadmium ores and concentrates					
United States	15	...	60	1	9	...
Japan	6	...	-	-	-	-
Total	21	...	60	1	9	...
2825.90.90.10	Cadmium oxide					
United States	493	10	245	5	1 056	24
United Kingdom	408	8	356	7	178	4
Belgium	186	4	10	...	190	4
Total	1 087	22	611	12	1 424	32
2830.30	Cadmium sulphide					
United States	11 388	6	47	...	241	...
Total	11 388	6	47	...	241	...
8107.10.00.10	Unwrought cadmium, not alloyed; powders, not alloyed					
United States	11	...	1 278	33	336	9
Japan	5	...	9	...	11	...
Germany	2	...	12	...	-	-
Total	18	...	1 299	33	347	9

TABLE 1 (cont'd)

Item No.	1999		2000		2001 (p)	
	(kg)	(\$000)	(kg)	(\$000)	(kg)	(\$000)
IMPORTS (cont'd)						
8107.10.00.20	Unwrought cadmium, alloyed; powders, alloyed					
	Switzerland	–	–	–	5	...
	Canada	33	1	–	–	–
	United States	807	24	3 438	83	–
	Germany	10	...	8	...	–
	South Africa	19	1	–	–	–
	Japan	26	1	8	...	–
	Total	895	27	3 454	83	5
8107.10.00.30	Cadmium waste and scrap					
	United States	153	4	–	–	80
	Canada	–	–	127	4	–
	Total	153	4	127	4	80
8107.90	Cadmium and articles thereof, n.e.s.					
	United States	14 892	210	16 577	276	19 938
	China	–	–	–	–	696
	United Kingdom	–	–	–	–	189
	Mexico	–	–	58	1	33
	Belgium	–	–	–	–	38
	Germany	–	–	–	–	23
	France	123	2	21	...	–
	Hong Kong	–	–	2	...	–
	Total	15 015	212	16 658	277	20 917
				1998	1999 (a)	2000 (p)(a)
					(kg)	
QUANTITY USED						
	Cadmium metal (3)					
	Plating		4 313		2 250	3 545
	Solders, other alloys and other uses (4)	112 809		136 539		168 759
	Total	117 122		138 789		172 304

Sources: Natural Resources Canada; Statistics Canada.

– Nil; ... Amount too small to be expressed; n.e.s. Not elsewhere specified; (p) Preliminary.

(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.

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

TABLE 2. CANADA, CADMIUM PRODUCTION AND EXPORTS, 1975 AND 1980-2001

	Production		Exports
	All Forms (1)	Refined(2)	Cadmium Metal
	(kg)		
1975	1 191 674	1 142 508	637 797
1980	1 033 000	1 302 955	1 095 825
1981	833 788	1 293 265	1 452 904
1982	886 055	1 162 390	769 505
1983	1 107 000	1 296 000	1 365 111
1984	1 605 286	1 756 707	1 369 422
1985	1 716 731	1 696 192	1 477 415
1986	1 483 907	1 551 732	1 382 807
1987	1 481 496	1 571 444	1 156 555
1988	1 663 978	1 693 708	1 142 716
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	1 452 481
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	1 903 369
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 (p)	1 058 140	1 429 132	1 399 039

Sources: Natural Resources Canada; Statistics Canada.

(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.

TABLE 3. WORLD PRODUCTION OF CADMIUM, 1995-2000

Country	1995	1996	1997	1998	1999	2000 (p)
	(tonnes)					
Algeria	50	44	36	13	–	–
Argentina	43	40	45	34	–	–
Australia	838	639	632	585	462	525
Belgium	1 710	1 579	1 420	1 318	1 235	1 148
Brazil	144	132	130	130	130	130
Bulgaria	305	251	183	195	217	233
Canada	2 349	2 433	2 260	2 090	1 911	2 024
China	1 533	1 567	1 982	2 125	2 154	2 200
Finland	534	648	494	520	700	680
France	–	92	309	177	195	160
Germany	1 145	1 145	1 140	1 020	1 145	1 130
India	254	271	296	295	278	315
Italy	308	296	287	328	360	284
Japan	2 652	2 344	2 473	2 337	2 567	2 472
Kazakhstan	794	567	819	1 463	1 061	257
Macedonia	70	12	10	10	10	10
Mexico	689	784	1 223	1 275	1 275	1 268
Namibia	15	7	2	–	–	–
Netherlands	704	603	718	739	731	628
North Korea	200	200	200	200	200	200
Norway	317	274	305	276	244	302
Peru	423	405	359	405	465	458
Poland	–	–	22	–	–	6
Russia	670	730	790	800	900	925
South Korea	1 665	930	1 000	1 178	1 791	1 911
Spain	397	306	301	196	–	–
Thailand	365	385	238	–	–	–
Turkey	36	42	89	69	64	–
Ukraine	15	–	–	–	–	–
United Kingdom	549	537	455	440	547	503
United States	1 266	1 525	2 059	1 240	1 185	1 890
Uzbekistan	100	100	100	100	100	100
Yugoslavia Federation	11	79	45	17	5	–
Total world	20 151	18 967	20 422	19 575	19 932	19 759

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

– Nil; (p) Preliminary.

TABLE 4. WORLD USE OF CADMIUM, 1995-2000

Country	1995	1996	1997	1998	1999	2000 (p)
	(tonnes)					
Argentina	60	40	45	34	21	12
Australia	24	24	24	24	24	24
Belgium	2 017	2 484	2 020	3 217	3 217	3 217
Brazil	100	100	100	100	100	100
Canada	102	144	139	199	157	159
China	600	600	600	600	600	600
Czech Republic	60	60	60	60	60	60
France	1 968	1 927	1 809	1 800	1 800	1 800
Germany	750	750	750	750	750	750
India	446	446	446	446	446	446
Italy	120	100	100	100	100	100
Japan	8 364	6 527	7 247	5 795	6 550	6 909
Mexico	140	140	140	140	140	140
Poland	26	20	35	10	6	7
Russia	197	600	800	1 086	1 110	1 110
South Africa	20	20	20	20	20	20
South Korea	380	380	380	380	380	380
Sweden	393	259	300	248	296	26
Taiwan	20	20	20	20	20	20
United Kingdom	588	618	631	626	631	585
United States	1 156	2 246	2 506	2 030	1 300	1 270
Yugoslavia Federation	30	30	30	30	30	30
Other	450	191	186	197	210	219
Total world	18 011	17 728	18 390	17 914	17 970	17 986

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

(p) Preliminary.

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