USGS
science for a changing world

2009 Minerals Yearbook

CADMIUM [ADVANCE RELEASE]

U.S. Department of the Interior
U.S. Geological Survey

March 2011

CADMIUM

By Amy C. Tolcin

Domestic survey data and tables were prepared by Susan M. Weaver, statistical assistant, and the world production table was prepared by Lisa D. Miller, international data coordinator.

In 2009, estimated cadmium metal production in the United States was 633 metric tons (t), 19% lower than that of 2008 (table 1). Apparent consumption of cadmium was 199 t, a 62% decrease from that of 2008. Cadmium metal (including alloys, powders, and waste and scrap) was primarily exported to China (51%), the Republic of Korea (12%), and Germany (4%) (table 3). Australia (31%), Peru (20%), and Canada (18%) supplied the bulk of the corresponding imports (table 4). The annual average New York dealer price of cadmium metal in 2009 declined by 52% from that of 2008 to $2.87 per kilogram ($1.30 per pound).

In 2009, global primary production of cadmium decreased by 7% to 18,800 t (table 5). Most of the world's primary cadmium was being produced in Asia and the Pacific—specifically China, Japan, and the Republic of Korea—followed by Central Europe and Eurasia, North America, and Western Europe. Global secondary cadmium production accounted for approximately 20% of all cadmium metal production. Most secondary metal was produced from nickel-cadmium (NiCd) battery recycling.

Leading consumers of refined cadmium were—in descending order of quantity—China, Belgium, and Japan. NiCd battery production continued to be the leading end use of cadmium, accounting for the majority of global cadmium consumption. Other significant end uses of cadmium included alloys, anticorrosive coatings, pigments, polyvinylchloride stabilizers, and semiconducting compounds for solar cells. The percentage of cadmium consumed globally for NiCd battery production has been increasing, while the percentages for the other traditional end uses of cadmium—specifically, coatings, pigments, and stabilizers—have gradually decreased because of environmental and health concerns. Most of the NiCd battery market was concentrated in Asia. Cadmium metal is sold in several shapes and forms, which are used for different types of consumption. Slabs or sticks are commonly consumed for alloys; balls and spheres for plating; and flakes, powder, or sticks for chemicals and pigments.

Production

Mine production.—Data on domestic mine production of cadmium were not collected by the U.S. Geological Survey (USGS). Primary cadmium is generally recovered from zinc concentrates. The cadmium content of typical zinc ores ranges from 0.2% to 0.3%. Sphalerite (ZnS), the most economically significant zinc mineral, is commonly impure; cadmium will often substitute for zinc in the crystal lattice. The cadmium mineral greenockite (CdS) is frequently associated with weathered sphalerites and wurtzites [(Zn, Fe)S], but usually at microscopic levels. In 2009, zinc-concentrate-producing States included Alaska, Idaho, Missouri, Tennessee, and Washington.

Metal production.—Domestic metal production data were collected by the USGS from a voluntary survey on production of cadmium metal and compounds. In 2009, cadmium metal was produced in three States—Ohio (Toxco, Inc.'s Lancaster facility), Pennsylvania [The International Metals Reclamation Co., Inc. (INMETCO's Ellwood City facility)], and Tennessee [Nyrstar NV's (Balen, Belgium) Clarksville facility].

Primary.—Clarksville (owned and operated by Nyrstar) is an electrolytic zinc refinery located along the Cumberland River 80 kilometers (km) northwest of Nashville, TN. The complex's main products were Special High Grade Zinc, galvanizing alloy, and byproducts including cadmium metal, intermediate copper cementate, leach product, sulfuric acid, and synthetic gypsum. Cadmium-bearing zinc concentrates were partially sourced from the recently reopened Tennessee Valley zinc mines. Remaining concentrates were imported.

Secondary.—INMETCO produced secondary cadmium metal (ingot and shot) at its metals recovery facility in Ellwood City, PA. The company was established in 1978 to process stainless steel wastes and then expanded in December 1995 to recycle NiCd batteries. The cadmium recovery plant thermally recovered cadmium from both large industrial and portable consumer NiCd batteries in eight cadmium retort furnaces. The bulk of the cadmium metal produced was sold back to battery manufacturers. Chromium and nickel were also reclaimed in the recovery process as a ferrous remelt alloy for stainless steel production. In addition to NiCd batteries, INMETCO also processed alkaline, lithium, magnesium, nickel chloride, nickel iron, nickel metal hydride, and zinc carbon batteries. On December 31, Horsehead Holding Corp. (Monaca, PA) acquired INMETCO from Vale Inco Ltd. (Toronto, Ontario, Canada) to increase its share of the battery recycling market and to recover metals from industrial wastes besides electric arc furnace (EAF) dust.

Toxco's (Anaheim, CA) recycling operations in Lancaster, OH, also produced secondary cadmium metal in the form of ingots. Cadmium was recovered from NiCd batteries in 12 cadmium retort furnaces, each with a 249-kilogram production capacity. Nickel-iron cells were also produced during the recycling process. Toxco acquired the cadmium recovery equipment from Moltech Power Systems Inc.'s (Marietta, GA) idled battery manufacturing facility in Gainesville, FL.

Consumption

Coatings and plating.—Cadmium coatings and plating can be applied to certain metals to prevent their corrosion. The amount of cadmium consumed for coatings and plating has decreased domestically during the past several decades as cadmium plated parts were phased out of motor vehicles by the automotive industry. However, cadmium coatings were still used by the aerospace industry and military for some critical applications where coating substitution may compromise operational safety;

the metal is commonly used to plate fasteners in aircraft landing gear and parachutes owing to a combination of properties not present in other anticorrosive coatings.

Nickel-cadmium batteries.—Reactions within a NiCd rechargeable battery take place between the nickel compounds at the positive electrode and between the cadmium compounds at the negative electrode. NiCd batteries have a high number of charge-discharge cycles, high rate of energy discharge, and a wide operating temperature. They power portable consumer electronics (commonly power tools) and provide emergency backup power for industrial applications and aircraft electrical systems.

Domestically, NiCd batteries were thought to have been produced at six facilities operated by four battery manufacturing companies. Globally, leading NiCd battery manufacturers included BYD Co., Ltd. (Pingshan, Shenzhen Province, China), Panasonic Corp. (Japan), and Sanyo Electric Co., Ltd. (Japan). NiCd battery use in consumer electronics was thought to be declining owing partly to the preference for other rechargeable battery chemistries—particularly lithium ion (Li-ion) batteries, which have already replaced NiCd batteries in cellular telephones and laptops owing to their high energy density. However, NiCd batteries have a cost advantage compared with other battery chemistries and are still favored for use in less expensive consumer appliances and electronics.

Industrial-sized NiCd batteries potentially could be used to store energy produced by certain on-grid solar or wind systems. About 2% of the Nation's power was generated by solar cells and wind farms. If this percentage were to increase to more than 10%, mass energy storage may be required for load leveling. Peak energy could be stored in a battery storage system, from which it would be later dispatched during periods of high electricity demand. NiCd batteries may be a favored battery chemistry for this use owing to their stability in offshore and harsh weather environments.

Pigments.—Cadmium pigments are inorganic and based on cadmium sulfide, which is golden yellow in color. The increased replacement of zinc or mercury for cadmium and selenium for sulfur forms the spectrum of cadmium pigments that range in color from bright yellow to maroon. Cadmium pigments are predominantly used to color plastics that are processed at higher temperatures; the pigments are able to withstand the elevated temperatures without degrading.

Solar cells.—Cadmium telluride (CdTe) flexible thin-film solar cells are an alternative to traditional crystalline silicon solar cells and are practical for commercial rooftop applications and large-scale, ground-mounted utility systems. CdTe photovoltaic cells are potentially a safe, environmentally friendly application for cadmium; the cadmium would remain contained and recyclable. CdTe cells contain an average of 7 grams (g) of cadmium per square meter. This equates to 70 g of cadmium per kilowatt of electric power produced, assuming the cells are 10% efficient. Companies involved in developing CdTe thin-film technology within the United States included Ascentool, Inc., AVA Solar, Inc., Canrom Photovoltaics, Inc., China Nuvo Solar Energy, First Solar, Inc., Primestar Solar, Inc., Solar Fields LLC, and Zia Watt Solar (Ullal and von Roedern, 2007).

Prices

Platts Metals Week publishes a weekly and monthly New York Dealer price for cadmium (minimum 99.95% purity) in dollars per pound. The 2009 average New York Dealer price for cadmium was $2.87 per kilogram ($1.30 per pound), 52% less than the average price in 2008. The average monthly New York dealer price in January was $1.82 per kilogram ($0.83 per pound) and rose to $3.51 per kilogram ($1.59 per pound) in December.

World Industry Structure

In 2009, global primary production of cadmium was 18,800 t. Most of the world's primary cadmium (approximately 55%) was being produced in Asia and the Pacific—specifically China, Japan, and the Republic of Korea—Central Europe and Eurasia (19%), North America (17%), and Western Europe (6%).

Global secondary cadmium production was thought to have accounted for approximately 20% of all cadmium metal production. Most secondary metal was produced at NiCd battery recycling facilities in Asia, Europe, and the United States. In Japan, NiCd battery recyclers included Kansai Catalyst Co., Ltd., Mitsui Mining and Smelting Co., Ltd., and Toho Zinc Co., Ltd. In Europe, NiCd battery recycling took place at Accurec GmbH's facility in Germany, Saft AB's plant in Sweden, and Societe Nouvelle D'Affinage des Metaux's two recycling facilities in France.

World Review

Australia.—Most of the cadmium metal produced domestically was exported; a small amount was consumed in the country by specialized electroplating industries. Nyrstar's Hobart zinc smelter, in Tasmania, produced cadmium metal from cadmium-bearing zinc concentrates sourced from the Century and Rosebery zinc-lead mines.

Sun Metals Corporation Pty. Ltd.'s (a subsidiary of Korea Zinc Co., Ltd.) zinc refinery near Townsville, North Queensland, had the capacity to produce 1,000 metric tons per year (t/yr) of cadmium cake (containing 75% to 80% cadmium). Sun Metals was thought to have exported most of the cadmium cake to Korea Zinc's Onsan zinc-lead refinery in the Republic of Korea, where it was refined into metal (Park, undated, p. 5).

Belgium.—Belgium was a significant consumer of refined cadmium. Most of this consumption took place at Floridienne Chimie S.A.'s plant for the production of cadmium compounds (carbonate, nitrate, and oxide) and powder, which were then exported to downstream consumers. It was estimated that the company consumed 4,800 to 7,200 t/yr of refined cadmium, accounting for almost 40% of global cadmium production. In October, Floridienne Chimie appointed MCP Group to source their cadmium metal requirements. Floridienne Chimie held a 40% share of MCP Group (Metal Bulletin, 2009c).

Brazil.—Votorantim Metais' (Sao Paulo, Brazil, a unit of Grupo Votorantim) Juiz de Fora zinc smelter in Minas Gerais was the sole producer of refined cadmium in Brazil.

Canada.—Teck Resources Ltd. (Vancouver, British Columbia, Canada) produced approximately 1,000 t/yr of

refined cadmium at its metallurgical complex at Trail, British Columbia. Refined zinc and lead metal were the main products produced at Trail along with a number of byproducts that included copper compounds, germanium dioxide, gold, indium, silver, and various sulfur products. The cadmium plant at Trail was constructed in 1991 to handle the increased cadmium input from the Red Dog Mine in Alaska and can produce up to 1,400 t/yr of refined cadmium. Cadmium metal products, which were mostly consumed by NiCd battery manufacturers, included balls, billets, and sticks. Teck also produced cadmium chemicals and continuously cast cadmium sheet. Cadmium sheet is commonly used to shield radiation measurement and control devices from slow neutrons. HudBay Minerals Inc.'s (Winnipeg, Manitoba) copper smelting and zinc refining operations in Flin Flon, Manitoba, also produced byproduct cadmium metal.

India.—Hindustan Zinc Ltd. (HZL, Udaipur) produced cadmium metal at its Chanderiya lead-zinc smelter complex, Debari zinc smelter, and Vizag zinc smelter. During 2009, the company continued to increase the lead-zinc production capacity at its refineries, which increased its production capacity of byproduct metals, including cadmium and silver. During the financial year ending March 31, 2010, HZL's cadmium metal production capacity was 833 t/yr. Cadmium production capacity by plant was as follows—Chanderiya, 460 t/yr; Debari, 235 t/yr; and Vizag, 138 t/yr. HZL produced 487 t of cadmium during its 2009–10 financial period (Hindustan Zinc Ltd., 2010, p. 52, 100).

Binani Zinc Ltd. also produced cadmium at its zinc plant in Binanipuram. Production capacity was 65 t/yr of refined cadmium (Metal Bulletin, 2009a).

Korea, Republic of.—Korea Zinc (Seoul, Republic of Korea) was one of the leading suppliers of cadmium metal to China. Production capacity of refined cadmium at the company's leading smelter, the Onsan zinc-lead refinery in Kyoung Nam Province, was approximately 3,000 t/yr. From August until December, Onsan ran at reduced capacity as Korea Zinc carried out repairs at the zinc smelter. As a result, the company said it was no longer able to offer cadmium on the spot market, as cadmium production rates were reduced by 50%. During this period, the company produced 15 metric tons per month (t/mo) of cadmium, compared with the normal 20 to 30 t/mo (Metal Bulletin, 2009b).

Cadmium was also produced at Young Poong Corp.'s (Seoul) Sukpo zinc refinery in the form of sticks. Cadmium production capacity at Sukpo was 805 t/yr. During the last half of the year, cadmium production was reduced to 20 to 30 t/mo from the normal 50 to 60 t/mo while the facility underwent an expansion to increase cadmium production capacity to 1,400 t/yr (Metal Bulletin, 2010).

Mexico.—Refined cadmium in Mexico was produced mainly at Industrias Peñoles S.A. de C.V.'s Met-Mex metallurgical complex in Torreon (in the form of balls and sticks) and at Grupo Mexico S.A. de C.V.'s electrolytic zinc refinery in San Luis Potosi (in the form of ingots, mini-jumbos, spheres, and sticks). Cadmium-bearing zinc concentrates treated at San Luis Potosi were sourced from Grupo Mexico's mines, principally the Charcas zinc mine. About 60% of the zinc concentrates processed at Met-Mex originated from Industrias Penoles' mines.

Peru.—Cadmium metal was produced at Votorantim's Cajamarquilla zinc refinery and at Doe Run Peru's (Lima) La Oroya metallurgical operations. Cajamarquilla had the capacity to produce 430 t/yr of cadmium.

Poland.—Zinc metal producer Huta Cynku Miasteczko Slaskie has been producing cadmium since mid-2000 and was the only cadmium producer in Poland. In 2008, the company began processing secondary materials—including Waelz oxides and EAF dust—along with zinc concentrates to reduce costs. Huta Cynku ultimately planned to completely switch its feedstock to secondary materials by 2010. Cadmium can be recovered from EAF dust (Leahy, 2008).

Russia.—Cadmium metal in Russia was produced at Chelyabinsk Zinc Plant OJSC's (Chelyabinsk) zinc refinery and Ural Mining and Metallurgy Company's (Sverdlovsk) Electrozinc lead-zinc refinery. Chelyabinsk's cadmium production decreased by 7% in 2009 from that of 2008 to 551 t (Chelyabinsk Zinc Plant OJSC, 2010, p. 13).

Outlook

Concern over cadmium's toxicity has spurred various legislative efforts, especially in the European Union, to restrict the use of cadmium in most of its end-use applications. However, cadmium-containing residues will continue to be produced as a byproduct from the zinc smelting process, regardless of cadmium demand. If the applications and markets for cadmium continue to decline, excess byproduct cadmium may need to be permanently stockpiled and managed, similar to the situation that the U.S. Government now faces with mercury.

However, demand for cadmium may increase owing to several new market opportunities for NiCd batteries, particularly in industrial applications. NiCd batteries power some battery electric vehicles in circulation and are also used as a source of power in a limited number of hybrid electric vehicles. NiCd batteries have also been used to support various renewable energy installations owing to their long service life, low maintenance, and stability in harsh weather environments. NiCd batteries were also used as a buffer in transportable, renewable hybrid-power systems developed to generate electricity in remote locations and underdeveloped regions.

References Cited

Chelyabinsk Zinc Plant OJSC, 2010, Annual report 2009: Chelyabinsk, Russia, Chelyabinsk Zinc Plant OJSC, 99 p.

Hindustan Zinc Ltd., 2010, Annual report 2009: Udaipur, India, Hindustan Zinc Ltd., 100 p.

Leahy, Kieran, 2008, Switch to secondary feed puts HCM back on track: American Metal Market, September 26. (Accessed September 26, 2008, via http://www.amm.com.)

Metal Bulletin, 2009a, HZL and Binani rebuff production cut claims as traders talk up Cd: Metal Bulletin, no. 9083, February 2, p. 4.

Metal Bulletin, 2009b, Korea Zinc running at 50% of cadmium capacity as maintenance continues: Metal Bulletin, no. 9113, August 31, p. 5.

Metal Bulletin, 2009c, MCP will buy cadmium for Floridienne Chimie–Boyle to lead purchasing team: Metal Bulletin, no. 9119, October 12, p. 10.

Metal Bulletin, 2010, Young Poong boosts cadmium capacity by 75%: Metal Bulletin, no. 9133, January 25, p. 18.

Park, Young-Min, [undated], Best practice—Energy management, Sun Metals Corpration, economic efficiency through process flexibility and price risk management: Townsville, Australia, Sun Metals Corp. Pty. Ltd., 39 p.
Ullal, H.S., and von Roedern, B., 2007, Thin film CIGS and CdTe photovoltaic technologies—Commercialization, critical issues, and applications (preprint): Boulder, CO, National Renewable Energy Laboratory, September, 4 p.

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

Cadmium. Ch. in Mineral Commodity Summaries, annual.
Cadmium. Ch. in United States Mineral Resources, Professional Paper 820, 1973.

Other

American Metal Market, daily.
Cadmium. Ch. in Minerals Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.
Company media releases, news releases, and regulatory filings.
Foreign Government publications.
Metal Bulletin, weekly, monthly.
Metals Insider, Reuters, daily.
Metal-Pages, daily.
Platts Metals Week, weekly.

TABLE 1
SALIENT CADMIUM STATISTICS[1, 2]

		2005	2006	2007	2008	2009
United States:						
Production of metal[3, 4]	metric tons	1,470	723	735	777	633
Shipments of metal by producers[4, 5]	do.	1,680	833	692	774	737
Exports of metal, alloys, scrap	do.	686	483	424	421	661
Imports for consumption, metal, alloys, and scrap	do.	288	180	316	197	122
Apparent consumption of metal	do.	2,060 r	530 r	594 r	528 r	199
Price, average, New York dealer[6]	dollars per pound	1.50	1.35	3.45	2.69	1.30
Do.[6]	dollars per kilogram	3.30	2.98	7.61	5.92	2.87
World, refinery production	metric tons	20,100	19,900	19,400	20,100 r	18,800 e

eEstimated. rRevised. Do., do. Ditto.

[1]Data are rounded to no more than three significant digits, except prices.

[2]Cadmium content.

[3]Primary and secondary cadmium metal. Includes equivalent metal content of cadmium sponge used directly in production of compounds.

[4]Partially estimated.

[5]Includes metal consumed at producer plants to make oxide and other cadmium compounds.

[6]Price for 1- to 5-short ton lots of metal having a minimum purity of 99.95% (Platts Metals Week).

TABLE 2
SUPPLY AND APPARENT CONSUMPTION OF CADMIUM METAL[1, 2]

(Metric tons)

	2005	2006	2007	2008	2009
Producer stocks, January 1[3]	1,170	184 r	74 r	107 r	132
Production[3]	1,470	723	735	777	633
Imports for consumption, metal, alloys, and scrap	288	180	316	197	122
Total supply	2,930	1,090 r	1,130 r	1,100 r	887
Exports of metal, alloys, scrap	686	483	424	421	661
Producer stocks, December 31[3]	184 r	74 r	107 r	132 r	27
Consumption, apparent[4]	2,060 r	530 r	594 r	528 r	199

rRevised.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Excludes supply and apparent consumption of cadmium sulfide, cadmium telluride, and related cadmium chemicals.

[3]Partially estimated. Beginning stocks may not equal ending stocks of the prior year owing to inventory adjustments.

[4]Total supply minus exports and yearend stocks.

TABLE 3
U.S. EXPORTS OF CADMIUM PRODUCTS, BY COUNTRY AND TYPE[1]

	2008		2009	
	Quantity (kilograms)	Value	Quantity (kilograms)	Value
Cadmium (Cd) metal:[2]				
Belgium	--	--	900	$18,100
Canada	48,500	$270,000	22,300	129,000
China	314,000	1,350,000	335,000	823,000
Colombia	2,390	26,100	--	--
Denmark	4,120	10,000	--	--
Germany	3,310	174,000	29,700	443,000
Israel	35,300	212,000	17,000	69,300
Korea, Republic of	21	7,010	76,900	274,000
Netherlands	--	--	17,000	161,000
Singapore	6,450	58,700	--	--
United Kingdom	5,950	97,700	3,380	22,600
Other	1,140 r	69,300 r	159,000	185,000
Total	421,000	2,270,000	661,000	2,120,000
Of which:				
Unwrought and powder	295,000	1,370,000	276,000	1,270,000
Waste and scrap	--	--	137,000	319,000
Other	126,000	901,000	249,000	537,000
Cadmium sulfide, gross weight:				
Hong Kong	5,000	2,600	--	--
India	16,500	8,590	--	--
Italy	24,500	12,800	--	--
Malaysia	171,000	89,000	--	--
Mexico	10,900	5,670	--	--
Switzerland	--	--	5,640	2,940
United Kingdom	13,200	6,860	10,600	5,510
Total	241,000	125,000	16,200	8,440
Total, calculated Cd content	188,000	XX	12,600	XX
Cadmium pigments:				
Brazil	16,300	68,200	11,300	52,300
Canada	73,700	1,280,000	116,000	1,820,000
China	16,400	46,400	13,600	44,500
Colombia	33,200	139,000	5,840	44,100
Dominican Republic	138,000	215,000	6,180	41,600
Ecuador	128,000	264,000	--	--
Germany	47,500	202,000	3,260	44,100
Guatemala	77,000	126,000	96,300	156,000
Hong Kong	4,490	40,300	24,600	42,200
Jamaica	57,300	116,000	58,800	99,600
Mexico	458,000	2,230,000	904,000	3,580,000
Morocco	17,000	24,700	--	--
New Zealand	17,000	25,400	--	--
Switzerland	15,000	885,000	10,800	1,090,000
Turkey	3,410	110,000	--	--
United Kingdom	2,770	127,000	211	4,480
Other	86,700	342,000	88,900	345,000
Total	1,190,000	6,240,000	1,340,000	7,360,000

rRevised. XX Not applicable. -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes exports of cadmium in alloys (Schedule B 8107.90) and waste and scrap (Schedule B 8107.30).

Source: U.S. Census Bureau.

TABLE 4
U.S. IMPORTS OF CADMIUM PRODUCTS, BY COUNTRY AND TYPE[1]

	2008		2009	
	Quantity (kilograms)	Value	Quantity (kilograms)	Value
Cadmium (Cd) metal:[2]				
Australia	51,000	$368,000	38,000	$121,000
Belgium	17,200	449,000	14,800	301,000
Canada	63,400	4,220,000	21,700	576,000
China	--	--	4,020	109,000
France	33	25,400	--	--
Germany	68	7,990	4,040	38,200
India	10	5,000	--	--
Japan	14	29,200	3	3,210
Malaysia	66	12,200	--	--
Mexico	40,000	312,000	11,500	25,500
Peru	25,000	194,000	24,000	63,000
Russia	2	18,000	--	--
Singapore	5	8,250	--	--
United Kingdom	--	--	3,960	247,000
Total	197,000	5,650,000	122,000	1,480,000
Of which:				
Unwrought and powder	153,000	5,090,000	117,000	1,110,000
Other	44,000	565,000	4,940	371,000
Cadmium oxide:				
Belgium	88,800	940,000	115,000	760,000
India	16,000	138,000	--	--
Japan	320	24,100	240	19,800
Netherlands	--	--	5,230	50,000
United Kingdom	7	5,870	25	2,200
Total	105,000	1,110,000	120,000	833,000
Total, calculated Cd content	92,000	XX	105,000	XX
Cadmium sulfide, gross weight:				
Canada	40,800	220,000	55,900	446,000
China	318,000	315,000	--	--
Germany	8	2,440	--	--
Russia	77,800	2,470,000	74,000	1,960,000
United Kingdom	1,820	35,100	4,720	21,200
Total	439,000	3,040,000	135,000	2,420,000
Total, calculated Cd content	341,000	XX	105,000	XX
Cadmium pigments:				
Belgium	10,900	188,000	750	11,100
Brazil	6,020	96,700	1,990	51,300
Canada	8,410	77,000	2,770	36,500
China	--	--	2,000	8,800
Finland	5,410	136,000	--	--
France	4,850	90,100	--	--
Germany	25,600	167,000	62,900	414,000
India	--	--	3	7,560
Japan	--	--	487	42,200
Mexico	241	3,590	--	--
Netherlands	45	2,820	--	--
Taiwan	500	3,080	--	--
United Kingdom	110,000	1,730,000	58,900	1,050,000
Total	172,000	2,500,000	130,000	1,630,000

See footnotes at end of table.

TABLE 4—Continued
U.S. IMPORTS OF CADMIUM PRODUCTS, BY COUNTRY AND TYPE[1]

XX Not applicable. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes imports of other cadmium [Harmonized Tariff Schedule of the United States (HTS) 8107.90.00] and waste and scrap (HTS 8107.30.00).

Source: U.S. Census Bureau.

TABLE 5
CADMIUM: WORLD REFINERY PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country[3]	2005	2006	2007	2008	2009[e]
Argentina	3	6	35 [r]	38 [r]	30
Australia	358	329	351	330	300
Brazil[4]	200	141	200 [e]	200 [e]	200
Bulgaria	319	363	459	460 [e]	460
Canada[5]	1,727	2,090	1,388	1,409 [r]	1,299 [p, 6]
China[e]	4,080	3,790	4,210	4,300	4,300
Germany[e]	640	640	400	400	400
India	409	457	583	599	610
Italy[e]	10	10	10	10	10
Japan	2,297	2,287	1,933	2,116	2,200
Kazakhstan	2,000	2,000	2,100	2,100 [e]	1,800
Korea, North[e]	200	200	200	200	200
Korea, Republic of	2,582	3,320	2,846	3,090 [r]	3,000
Mexico[7]	1,653	1,401	1,617	1,550 [r]	1,210
Netherlands	494	524	495	530	530
Norway	153	125	269	178	175
Peru	481	416	347	371	375
Poland	408	373	421	603 [r]	600
Russia	621	690	810	800	700
Ukraine[e]	25	25	25	25	25
United States[5]	1,470	723	735	777	633 [6]
Total	20,100	19,900	19,400	20,100 [r]	18,800

[e]Estimated. [p]Preliminary. [r]Revised.
[1]This table gives unwrought production from ores, concentrates, flue dusts, and other materials of both domestic and imported origin. Sources generally do not indicate if secondary metal (recovered from scrap) is included or not, where known, this has been indicated by a footnote. Data derived in part from World Metal Statistics (published by World Bureau of Statistics, Ware, United Kingdom) and from Metal Statistics (published jointly by Metallgesellschaft AG of Frankfurt am Main, Germany, and World Bureau of Metal Statistics). Cadmium is found in ores, concentrates, and/or flue dusts in several other countries, but these materials are exported for treatment elsewhere to recover cadmium metal; therefore, such output is not reported in this table to avoid double counting. This table includes data available through May 6, 2010.
[2]World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.
[3]Romania, Thailand, and Uzbekistan may produce primary cadmium metal or oxide, but information is inadequate to make reliable estimates of output.
[4]Data for 2005 are exports from Anuario Mineral Brasileiro (Departmento Nacional de Producao Mineral).
[5]Includes secondary.
[6]Reported figure.
[7]Excludes significant production of both cadmium oxide and cadmium contained in exported concentrates.