CADMIUM

(Data in metric tons of cadmium content unless otherwise noted)

Domestic Production and Use: Three companies in the United States were thought to have produced refined cadmium in 2009. One company, operating in Tennessee, recovered primary cadmium as a byproduct of zinc leaching from roasted sulfide concentrates. The other two companies, with facilities in Ohio and Pennsylvania, thermally recovered secondary cadmium metal from spent nickel-cadmium (NiCd) batteries and other cadmium-bearing scrap. Based on the average New York dealer price, U.S. cadmium metal consumption was valued at about $1.97 million in 2009.

Salient Statistics—United States:	2005	2006	2007	2008	2009[e]
Production, refinery[1]	1,470	723	735	777	700
Imports for consumption, metal only	207	179	315	153	187
Imports for consumption, metal, alloys, scrap	288	180	316	197	194
Exports, metal only	([2])	18	270	295	305
Exports, metal, alloys, scrap	686	483	424	421	676
Consumption of metal, apparent	699	568	585	550	228
Price, metal, average annual:[3]					
Dollars per kilogram	3.31	2.98	7.61	5.93	2.69
Dollars per pound	1.50	1.35	3.45	2.69	1.22
Stocks, yearend, producer and distributor	1,540	1,400	1,440	1,460	1,450
Net import reliance[4] as a percentage of apparent consumption	E	E	E	E	E

Recycling: Cadmium is mainly recovered from spent consumer and industrial NiCd batteries. Other waste and scrap from which cadmium can be recovered includes copper-cadmium alloy scrap, some complex nonferrous alloy scrap, and cadmium-containing dust from electric arc furnaces (EAF). The amount of cadmium recycled was not disclosed.

Import Sources (2005-08): Metal:[5] Mexico, 30%; Australia, 25%; Canada, 18%; Peru, 8%; and other, 19%.

Tariff: Item	Number	Normal Trade Relations[6] 12-31-09
Cadmium oxide	2825.90.7500	Free.
Cadmium sulfide	2830.90.2000	3.1% ad val.
Pigments and preparations based on cadmium compounds	3206.49.6010	3.1% ad val.
Unwrought cadmium and powders	8107.20.0000	Free.
Cadmium waste and scrap	8107.30.0000	Free.
Wrought cadmium and other articles	8107.90.0000	4.4% ad val.

Depletion Allowance: 22% (Domestic), 14% (Foreign).

Government Stockpile: None.

Events, Trends, and Issues: Global refinery production of cadmium was estimated to decrease in 2009 as a result of production cutbacks at several zinc smelters that also recovered byproduct cadmium. Domestic apparent consumption of cadmium decreased in 2009 as a result of decreased refined production and a significant rise in cadmium exports during the year, possibly owing to an increase in the production of cadmium-containing products overseas. Global consumption of cadmium was expected to remain flat.

Most of the world's primary cadmium was produced in Asia and the Pacific—specifically China, Japan, and the Republic of Korea—followed by North America, Central Europe and Eurasia, and Western Europe. Secondary cadmium production takes place mainly at NiCd battery recycling facilities.

Cadmium use in batteries accounted for the majority of global consumption. The remainder was distributed as follows, in order of descending consumption: pigments, coatings and plating, stabilizers for plastics, nonferrous alloys, and other specialized uses (including photovoltaic devices). 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, owing to environmental and health concerns. A large percentage of the global NiCd battery market was concentrated in Asia.

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CADMIUM

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 to a large degree in laptops and cell phones. Li-ion batteries are used in lightweight electronic devices because of their greater energy density (power-to-weight ratio). However, demand for cadmium may increase owing to several new market opportunities for NiCd batteries, particularly in industrial applications. Industrial-sized NiCd batteries could also be used to store energy produced by certain on-grid photovoltaic systems. Peak energy produced during the midday would be stored in a NiCd battery and later dispatched during periods of high electricity demand.

Concern over cadmium's toxicity has spurred various recent legislative efforts, especially in the European Union, to restrict the use of cadmium in most of its end-use applications. The final effect of this legislation on global cadmium consumption has yet to be seen. If recent legislation involving cadmium dramatically reduces long-term demand, a situation could arise, such as has been recently seen with mercury, where an accumulating oversupply of byproduct cadmium will need to be permanently stockpiled.

World Refinery Production and Reserves: Cadmium reserves were calculated as a percentage of zinc reserves. Changes to cadmium reserves data from the prior year reflect a reevaluation of zinc reserves globally and by country.

	Refinery production		Reserves[7]
	2008	2009[e]	
United States	777	700	39,000
Australia	330	330	63,000
Canada	1,300	1,150	24,000
China	4,300	4,300	90,000
Germany	400	400	—
India	599	700	27,000
Japan	2,120	1,990	—
Kazakhstan	2,100	2,100	51,000
Korea, Republic of	2,900	2,300	—
Mexico	1,610	1,580	42,000
Netherlands	530	530	—
Peru	371	275	48,000
Poland	420	410	23,000
Russia	800	800	72,000
Other countries	1,040	1,240	110,000
World total (rounded)	19,600	18,800	590,000

World Resources: Cadmium is generally recovered as a byproduct from zinc concentrates. Zinc-to-cadmium ratios in typical zinc ores range from 200:1 to 400:1. Sphalerite (ZnS), the most economically significant zinc mineral, commonly contains minor amounts of other elements; cadmium, which shares certain similar chemical properties with zinc, will often substitute for zinc in the sphalerite crystal lattice. The cadmium mineral greenockite (CdS) is frequently associated with weathered sphalerite and wurtzite but usually at microscopic levels. Zinc-bearing coals of the Central United States and Carboniferous age coals of other countries also contain large subeconomic resources of cadmium.

Substitutes: Lithium-ion and nickel-metal hydride batteries are replacing NiCd batteries in some applications. However, the higher cost of these substitutes restricts their use in less-expensive products. Except where the surface characteristics of a coating are critical (e.g., fasteners for aircraft), coatings of zinc or vapor-deposited aluminum can be substituted for cadmium in many plating applications. Cerium sulfide is used as a replacement for cadmium pigments, mostly in plastics. Barium/zinc or calcium/zinc stabilizers can replace barium/cadmium stabilizers in flexible polyvinylchloride applications.

[e]Estimated. E Net exporter. — Zero.
[1]Cadmium metal and oxide produced as a byproduct of lead-zinc refining plus metal from recycling.
[2]Less than ½ unit.
[3]Average New York dealer price for 99.95% purity in 5-short-ton lots. Source: Platts Metals Week.
[4]Defined as imports – exports + adjustments for Government and industry stock changes.
[5]Imports for consumption of unwrought metal and metal powders (Tariff no. 8107.20.0000).
[6]No tariff for Australia, Canada, and Mexico for items shown.
[7]See Appendix C for definitions. Reserve base estimates were discontinued in 2009; see Introduction.