

CADMIUM

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

Domestic Production and Use: Three companies in the United States produced refined cadmium in 2013. One company, operating in Tennessee, recovered primary cadmium as a byproduct of zinc leaching from roasted sulfide concentrates. The other two companies, operating in Ohio and Pennsylvania, thermally recovered secondary cadmium metal from spent nickel-cadmium (NiCd) batteries and other cadmium-bearing scrap. Cadmium metal and compounds are mainly consumed for alloys, coatings, NiCd batteries, pigments, and plastic stabilizers.

Salient Statistics—United States:	2009	2010	2011	2012	2013^e
Production, refinery ¹	633	637	W	W	W
Imports for consumption:					
Metal	117	216	201	170	300
Alloys	5	5	9	21	200
Scrap	—	(²)	(²)	1	—
Exports:					
Metal	276	75	63	253	160
Alloys	249	231	204	378	210
Scrap	137	—	5	—	20
Consumption of metal, apparent	199	477	W	W	W
Price, metal, annual average, ³ dollars per kilogram	2.87	3.90	2.76	2.03	1.95
Stocks, yearend, producer and distributor	27	102	W	W	W
Net import reliance ⁴ as a percentage of apparent consumption	E	E	E	E	<25%

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 available.

Import Sources (2009–12): Metal.⁵ Australia, 24%; Mexico, 19%; Canada, 14%; Germany, 11%; and other, 32%.

Tariff: Item	Number	Normal Trade Relations⁶ 12–31–13
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: Most of the world's primary cadmium metal was produced in Asia. Leading producers were China, the Republic of Korea, and Japan. Secondary production accounted for about 20% of global production.

Cadmium was primarily consumed in China, Belgium, and Japan. Cadmium for NiCd batteries accounted for more than 80% of global consumption, and 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 share of cadmium consumed globally for NiCd battery production has been increasing, while the shares for the traditional end uses of cadmium—specifically coatings, pigments, and stabilizers—have gradually decreased owing to environmental and health concerns.

The U.S. market price for 99.95%-purity cadmium remained stable during the first quarter of 2013, averaging \$1.83 per kilogram for the months of January through March. Subsequently, prices rose, averaging \$1.88 per kilogram in April and reaching \$1.98 per kilogram in July, where they remained through September.

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In February, a major global aircraft manufacturer announced that it no longer planned to equip its new aircraft with lithium-ion (Li-ion) batteries and instead would revert back to the use of NiCd batteries. The announcement was made after the U.S. Federal Aviation Administration grounded an aircraft in January following two fire incidents originating from Li-ion batteries. Another company modified its Li-ion battery technology to avoid further incidents.

In October, the European Union (EU) amended Directive 2006/66/EC to prohibit the use of NiCd batteries in cordless power tools. The original directive prohibited the inclusion of NiCd batteries in electronic devices for sale within the EU, with the exception of cordless power tools, emergency systems, and medical equipment. The revision to end the exemption on power tools was to take effect on January 31, 2016.

World Refinery Production and Reserves:

	Refinery production		Reserves ⁷
	<u>2012</u>	<u>2013^e</u>	
United States	W	W	32,000
Australia	380	380	NA
Bulgaria	420	420	NA
Canada	1,100	800	23,000
China	7,300	7,400	92,000
India	620	630	35,000
Japan	1,800	1,900	—
Kazakhstan	1,300	1,400	30,000
Korea, Republic of	3,000	3,900	—
Mexico	1,624	1,630	47,000
Netherlands	560	560	—
Peru	684	685	55,000
Poland	530	400	16,000
Russia	700	850	44,000
Other countries	<u>880</u>	<u>850</u>	<u>130,000</u>
World total (rounded)	⁸ 20,900	⁸ 21,800	500,000

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 cadmium, which shares certain similar chemical properties with zinc and often substitutes for zinc in the sphalerite crystal lattice. The cadmium mineral greenockite (CdS) is frequently associated with weathered sphalerite and wurtzite. Zinc-bearing coals of the Central United States and Carboniferous age coals of other countries also contain large subeconomic resources of cadmium.

Substitutes: Li-ion and nickel-metal hydride batteries are replacing NiCd batteries in some applications. However, the higher cost of these alternatives restricts their use in less-expensive products. Except where the surface characteristics of a coating are critical (for example, 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.

^eEstimated. E Net exporter. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.

¹Cadmium metal produced as a byproduct of lead-zinc refining plus metal from recycling.

²Less than ½ unit.

³Average New York dealer price for 99.95% purity in 5-short-ton lots. Source: Platts Metals Week.

⁴Defined as imports – exports + adjustments for Government and industry stock changes.

⁵Imports for consumption of unwrought metal and metal powders (Tariff no. 8107.20.0000).

⁶No tariff for Australia, Canada, Mexico, and Peru for items shown.

⁷[See Appendix C for resource/reserve definitions and information concerning data sources.](#)

⁸Does not include production in Italy, North Korea, and the United States.