CADMIUM

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

Domestic Production and Use: Two companies in the United States produced cadmium in 2005. One company in Tennessee produced cadmium metal as a byproduct of smelting and refining zinc metal from imported sulfide ores, while another company in Pennsylvania produced cadmium metal from cadmium-containing scrap, mainly from spent nickel-cadmium (NiCd) batteries. Based on the average New York dealer price, U.S. cadmium metal production was valued at about $1.82 million in 2005. Between 2001 and 2005, domestic consumption of cadmium metal declined by about 35% in response to environmental concerns. Cadmium use in batteries amounted to 81% of apparent consumption. The remaining 19% was distributed as follows: pigments, 10%; coatings and plating, 7%; stabilizers for plastics, 1.5%; and nonferrous alloys and other, 0.5%.

Salient Statistics—United States:	2001	2002	2003	2004	2005[e]
Production, refinery[1]	680	700	670	550	550
Imports for consumption, metal	107	25	18	38	35
Exports of metal, alloys, scrap	272	168	558	132	200
Shipments from Government stockpile excesses	34	693	80	—	—
Consumption, apparent	659	561	530	496	430
Price, metal, average annual:[2]					
Dollars per kilogram	0.50	0.64	1.31	1.20	3.31
Dollars per pound	0.23	0.29	0.59	0.55	1.50
Stocks, yearend, producer and distributor	1,090	1,750	1,460	1,420	1,380
Net import reliance[3] as a percentage of apparent consumption	E	E	E	E	E

Recycling: Cadmium is recovered from spent NiCd batteries, 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. In 2005, the U.S. steel industry generated about 0.7 million tons of EAF dust, typically containing 0.003% to 0.07% cadmium.

Import Sources (2001-04): Metal:[4] Mexico, 46%; Australia, 31%; Canada, 12%; Belgium, 8%; and other, 3%.

Tariff: Item	Number	Normal Trade Relations[5] 12-31-05
Cadmium sulfide	2830.30.0000	3.1% ad val.
Pigments and preparations based on cadmium compounds	3206.30.0000	3.1% ad val.
Unwrought cadmium and powders	8107.20.0000	Free.
Cadmium waste and scrap	8107.30.0000	Free.
Cadmium other	8107.90.0000	4.4% ad val.

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

Government Stockpile: None.

Events, Trends, and Issues: During the past decade, increased environmental awareness has resulted in regulatory pressure to reduce or even eliminate the use of cadmium in many developed countries. In the United States, Federal and State environmental agencies regulate industrial releases of cadmium and other heavy metals. The U.S. Environmental Protection Agency (EPA) identified cadmium as a persistent and bioaccumulative toxic pollutant. The European Union is evaluating a proposal to ban, with some exemptions, NiCd batteries containing more than 0.002% cadmium beginning on January 1, 2008, and to increase the fraction of spent industrial and portable rechargeable batteries collected. Declining production of cadmium metal in developed countries was offset by increased production in China and other developing countries where manufacturing of NiCd batteries was increasing. Although demand for cadmium in traditional uses such as pigments and stabilizers is decreasing, potential new uses for cadmium in the electronics sector are emerging. For example, in 2005, researchers in Berkeley, California, synthesized ultrathin photovoltaic films comprised of cadmium selenide (CdSe) and cadmium telluride (CdTe) nanocrystals. If the efficiencies of these films for converting sunlight to electricity can be improved, and manufacturing becomes economically viable, solar cells could become an important market for cadmium. One use would be to generate electricity in remote arid areas where supplies of oil and natural gas are not readily available. Such new electronic demand for cadmium could partially absorb the cadmium projected to be available from the forecast growth in zinc refining. Increased demand for cadmium could encourage recycling, while simultaneously discouraging stockpiling of cadmium-bearing jarosite and other wastes at zinc refineries.

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CADMIUM

In 2003, the European Union adopted a set of environmental regulations that are having a profound impact on electronics and semiconductor manufacturing worldwide. One particular directive in this set—The Restriction of the Use of Hazardous Substances (RoHS)—prohibits the incorporation of cadmium and other heavy metals in most electrical and electronic equipment sold in the European Union after July 1, 2006. Cadmium plating of electronic components is exempt from RoHS. In 2005, the Environment Council of the European Union adopted a directive that bans the sale of certain types of portable NiCd batteries. NiCd batteries are restricted to use in alarm and emergency systems, cordless power tools, and medical equipment.

World Refinery Production, Reserves, and Reserve Base:

	Refinery production		Reserves[6]	Reserve base[6]
	2004	2005[e]		
United States	550	550	90,000	270,000
Australia	350	460	110,000	300,000
Belgium	120	120	—	—
Canada	1,888	1,400	55,000	100,000
China	2,800	3,000	90,000	380,000
Germany	640	420	6,000	8,000
India	489	500	3,000	5,000
Japan	2,233	2,400	10,000	15,000
Kazakhstan	1,900	2,300	50,000	100,000
Korea, Republic of	2,100	2,200	—	—
Mexico	1,600	1,600	35,000	40,000
Peru	532	600	12,000	13,000
Russia	950	1,050	16,000	30,000
Other countries	2,650	1,410	120,000	540,000
World total (rounded)	18,800	18,000	600,000	1,800,000

World Resources: The bulk of the cadmium being recovered is associated with ores of sphalerite (ZnS). Estimated world identified resources of cadmium were about 6 million tons based on identified zinc resources of 1.9 billion tons containing about 0.3% cadmium. 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.

[e]Estimated. E Net exporter. — Zero.

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

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

[3]Defined as imports – exports + adjustments for Government and industry stock changes.

[4]Combined imports of cadmium metal, including unwrought and wrought metal, metal powders, and waste and scrap.

[5]No tariff for Canada and Mexico for items shown.

[6]See Appendix C for definitions.