ARSENIC

(Data in metric tons of arsenic unless otherwise noted)

Domestic Production and Use: There has been no domestic production of arsenic trioxide or arsenic metal since 1985. Imports of arsenic trioxide averaged over 20,000 tons annually during 2001-03 and were used mainly in the production of chromated copper arsenate (CCA) wood preservatives. The grids in lead-acid storage batteries were strengthened by the addition of arsenic metal, and small-arms ammunition used by the United States military was hardened by the addition of less than 1% arsenic metal. Other applications of arsenic metal include its use as an antifriction additive for bearings, in lead shot, and in clip-on wheel weights. Arsenic compounds were used in fertilizers, fireworks, herbicides, and insecticides. The electronics industry used high-purity arsenic (99.9999%) for gallium-arsenide semiconductors that are used for solar cells, space research, and telecommunication. Arsenic may be used for germanium-arsenide-selenide specialty optical materials. Indium-gallium-arsenide was used for short wave infrared technology. The value of arsenic compounds and metal consumed domestically in 2007 was estimated to be about $9 million.

Salient Statistics—United States:	2003	2004	2005	2006	2007[e]
Imports for consumption:					
Metal	990	872	812	1,070	1,000
Trioxide	20,800	6,150	8,330	9,330	9,000
Exports, metal	173	220	3,270	3,060	5,500
Estimated consumption[1]	21,600	6,800	5,870	7,340	4,500
Value, cents per pound, average:[2]					
Metal (China)	87	88	95	160	130
Trioxide (China)	45	49	18	22	25
Trioxide (Mexico)	34	32	67	NA	NA
Net import reliance[3] as a percentage of estimated consumption	100	100	100	100	100

Recycling: Electronic circuit boards, relays, and switches may contain arsenic and should be disposed of at sites that recycle arsenic-containing, end-of-service electronics or at hazardous waste sites. Arsenic contained in the process water at wood treatment plants where CCA was used was recycled. Approximately 7 tons of arsenic was recovered from gallium-arsenide scrap from semiconductor manufacturing. There was no recovery or recycling of arsenic from arsenic-containing residues and dusts at nonferrous smelters in the United States.

Import Sources (2003-06): Metal: China, 86%; Japan, 13%; and other, 1%. Trioxide: China, 63%; Morocco, 25%; Hong Kong, 4%; Chile, 3%; and other, 5%.

Tariff: Item	Number	Normal Trade Relations 12-31-07
Metal	2804.80.0000	Free.
Acid	2811.19.1000	2.3% ad val.
Trioxide	2811.29.1000	Free.
Sulfide	2813.90.1000	Free.

Depletion Allowance: 14% (Domestic and foreign).

Government Stockpile: None.

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Events, Trends, and Issues: Exposure to arsenic may affect breathing, heart rhythm, and possibly increase the risk for bladder cancer. Therefore, in response to these human health issues, the wood-preserving industry made a voluntary decision to stop using CCA to treat wood used for decks and outdoor residential use by yearend 2003. Arsenic trioxide imports, mainly from China, had dropped to 6,150 tons in 2004 compared with 20,800 tons in 2003. The 70% decline in arsenic trioxide imports was in response to this industry decision. Imports of arsenic trioxide have increased somewhat since 2004 but are still less than 10,000 tons per year. Because of known performance and lower cost, CCA may still be used to treat wood used for nonresidential applications. Human health concerns, regulation, use of alternative wood preservation material, and the substitution of concrete or plasticized wood products will affect the long-term demand for arsenic.

Arsenic metal export data for 2005 have been revised; exports rose sharply from 2004 levels. Export destinations for arsenic metal were the Republic of Korea (55%) and Taiwan (28%). Possible uses of the metal include electronics applications or in the production of small-arms ammunition. Imports of arsenic metal averaged 900 tons from 2002 to 2006.

Arsenic in ground water is another concern, and the U.S. Environmental Protection Agency has set the arsenic standard at 0.010 part per million. Water treatment systems were to meet this standard by January 23, 2006. Geologic sources and the effects of high levels of arsenic are the focus of global government and university research.

Rice grown in the United States may contain from one to five times the arsenic contained in rice from Bangladesh, Europe, and India. Arsenic was added to chicken feed in order to promote growth, kill parasites, and improve pigmentation of chicken meat; therefore, chicken manure may introduce arsenic to agricultural fields and ultimately to ground water. Arsenic was used as an embalming agent during the Civil War and now may be leached from Civil War-era cemeteries. Arsenic may also be released from coal-burning powerplant emissions and from buried World War I ammunition. Several contaminants, including arsenic, were found in sludge deposited across New Orleans in the aftermath of Hurricane Katrina. Arsenic trioxide may be used to treat leukemia.

World Production, Reserves, and Reserve Base:

	Production (arsenic trioxide)		Reserves and reserve base[4] (arsenic content)
	2006	2007[e]	
Belgium	1,000	1,000	
Chile	11,800	11,500	World reserves and reserve base are thought to be about 20 and 30 times, respectively, annual world production. The reserve base for the United States is estimated to be 80,000 tons.
China	30,000	30,000	
France	1,000	1,000	
Kazakhstan	1,500	1,500	
Mexico	1,750	1,400	
Morocco	6,900	6,900	
Peru	3,500	3,500	
Russia	1,500	1,500	
Other countries	800	1,000	
World total (rounded)	59,800	59,000	

World Resources: Arsenic may be obtained from roasting arsenopyrite, the most abundant ore mineral of arsenic, as well as from copper, gold, and lead smelter dust. Arsenic may be recovered from enargite, a copper mineral, and associated alteration products; realgar and orpiment in China, Peru, and the Philippines; copper-gold ores in Chile; and associated with gold occurrences in Canada. In Sichuan Province, China, orpiment and realgar from gold mines are stockpiled for transport and later recovery of arsenic. Global resources of copper and lead contain approximately 11 million tons of arsenic.

Substitutes: Wood-treatment substitutes include alkaline copper quaternary, ammoniacal copper quaternary, ammoniacal copper zinc arsenate, copper azole, and copper citrate. In humid areas, silver-containing biocides are being considered as an alternative wood preservative. Other CCA-treated wood substitutes include concrete, steel, plasticized wood scrap, or plastic composites.

[e]Estimated. NA Not available.

[1]Estimated to be the same as net imports.

[2]Calculated from U.S. Census Bureau import data.

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

[4]See Appendix C for definitions.