

ARSENIC

(Data in metric tons of arsenic content¹ unless otherwise noted)

Domestic Production and Use: Arsenic trioxide and primary arsenic metal have not been produced in the United States since 1985. The principal use for arsenic trioxide was for the production of arsenic acid used in the formulation of chromated copper arsenide (CCA) preservatives for the pressure treating of lumber used primarily in nonresidential applications. Three companies produced CCA preservatives in the United States in 2016. Ammunition used by the U.S. military was hardened by the addition of less than 1% arsenic metal, and the grids in lead-acid storage batteries were strengthened by the addition of arsenic metal. Arsenic metal was also used as an antifriction additive for bearings, to harden lead shot, and in clip-on wheel weights. Arsenic compounds were used in herbicides and insecticides. High-purity arsenic (99.9999%) was used by the electronics industry for GaAs semiconductors that are used for solar cells, space research, and telecommunications. Arsenic also was 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 imported domestically in 2016 was estimated to be about \$6.5 million.

Salient Statistics—United States:	2012	2013	2014	2015	2016^e
Imports for consumption:					
Arsenic	883	514	688	514	800
Compounds	5,720	6,290	5,260	5,920	5,600
Exports, arsenic ²	444	1,630	2,970	1,670	1,900
Estimated consumption ³	6,620	6,810	5,940	6,430	6,400
Value, cents per pound, average ⁴					
Arsenic (China)	75	72	75	84	88
Trioxide (Morocco)	24	27	30	29	31
Net import reliance ⁵ as a percentage of estimated consumption	100	100	100	100	100

Recycling: Arsenic metal was contained in new scrap recycled during GaAs semiconductor manufacturing. Arsenic was also contained in the process water, which was recycled at wood treatment plants where CCA was used. Although electronic circuit boards, relays, and switches may contain arsenic, no arsenic was known to have been recovered from them during recycling to recover other contained metals. No arsenic was recovered domestically from arsenic-containing residues and dusts generated at nonferrous smelters in the United States.

Import Sources (2012–15): Arsenic: China, 89%; Japan, 10%; and other, 1%. Arsenic trioxide: Morocco, 55%; China, 35%; Belgium, 8%; and other, 2%.

Tariff: Item	Number	Normal Trade Relations 12–31–16
Arsenic	2804.80.0000	Free.
Arsenic acid	2811.19.1000	2.3% ad val.
Arsenic trioxide	2811.29.1000	Free.
Arsenic sulfide	2813.90.1000	Free.

Depletion Allowance: 14% (Domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: China and Morocco continued to be the leading global producers of arsenic trioxide, accounting for 87% of estimated world production and supplying almost all of U.S. imports of arsenic trioxide in 2016. China was the leading world producer of arsenic metal and supplied about 89% of U.S. arsenic metal imports in 2016.

Given that arsenic metal has not been produced domestically since 1985, it is likely that only a small portion of the material reported by the U.S. Census Bureau as arsenic exports was pure arsenic metal, and most of the material that has been reported under this category reflects the gross weight of compounds, alloys, and residues containing arsenic. Therefore, the estimated consumption reported under salient U.S. statistics reflects only imports of arsenic products.

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High-purity (99.9999%) arsenic metal was used to produce gallium-arsenide (GaAs), indium-arsenide, and indium gallium-arsenide semiconductors that were used in biomedical, communications, computer, electronics, and photovoltaic applications. In 2015, the value of global GaAs device sales increased slightly to an estimated \$7 billion, with wireless applications accounting for about 80% of revenue. See the Gallium chapter for additional details.

Concern over the adverse effects of arsenic from natural and anthropogenic sources has led to numerous studies of arsenic in food and water. In March, the U.S. Food and Drug Administration (FDA) released a revised risk assessment for arsenic in rice and rice products. In April, the FDA took steps to reduce inorganic arsenic in infant rice cereal, a leading source of arsenic exposure in infants, and proposed a limit or “action level” of 100 parts per billion for inorganic arsenic. FDA testing found that the majority of infant rice cereal currently on the market either meets, or is close to, the proposed action level.

World Production and Reserves:

	Production ⁶ (arsenic trioxide)		Reserves ⁷
	<u>2015</u>	<u>2016^e</u>	
United States	—	—	World reserves data are unavailable but are thought to be more than 20 times world production.
Belgium	1,000	1,000	
Bolivia	50	50	
China	25,000	25,000	
Japan	45	45	
Morocco	6,900	7,000	
Namibia	1,960	1,900	
Russia	<u>1,500</u>	<u>1,500</u>	
World total (rounded)	36,500	36,500	

World Resources: Arsenic may be obtained from copper, gold, and lead smelter flue dust, as well as from roasting arsenopyrite, the most abundant ore mineral of arsenic. Arsenic has been recovered from realgar and orpiment in China, Peru, and the Philippines; has been recovered from copper-gold ores in Chile; and was associated with gold occurrences in Canada. Orpiment and realgar from gold mines in Sichuan Province, China, were stockpiled for later recovery of arsenic. Arsenic also may be recovered from enargite, a copper mineral.

Substitutes: Substitutes for CCA in wood treatment include alkaline copper quaternary, ammoniacal copper quaternary, ammoniacal copper zinc arsenate, copper azole, and copper citrate. Treated wood substitutes include concrete, plastic composite material, plasticized wood scrap, or steel.

^eEstimated. — Zero.

¹Arsenic content of arsenic metal is 100%; arsenic content of arsenic compounds is calculated at 75.71%.

²Most of the materials reported to the U.S. Census Bureau as arsenic exports are thought to be arsenic-containing compounds or residues.

³Estimated to be the same as imports.

⁴Calculated from U.S. Census Bureau import data.

⁵Defined as imports.

⁶Chile, Mexico, and Peru were believed to be significant producers of commercial-grade arsenic trioxide, but have reported no production in recent years.

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