THALLIUM

(Data in kilograms of thallium content unless otherwise noted)

Domestic Production and Use: Thallium has not been recovered in the United States since 1981. Consumption of thallium metal and thallium compounds was valued at $2.4 million. The primary end uses included the following: radioactive thallium-201 used for medical purposes in cardiovascular imaging; thallium as an activator (sodium iodide crystal doped with thallium) in gamma radiation detection equipment (scintillometer); thallium-barium-calcium-copper oxide high-temperature superconductor used in filters for wireless communications; thallium in lenses, prisms, and windows for infrared detection and transmission equipment; thallium-arsenic-selenium crystal filters for light diffraction in acousto-optical measuring devices; and thallium in mercury alloys for low-temperature measurements. Other uses include: as an additive in glass to increase its refractive index and density, a catalyst for organic compound synthesis, and a component in high-density liquids for gravity separation of minerals.

Salient Statistics—United States:	2012	2013	2014	2015	2016[e]
Production, refinery	—	—	—	—	—
Imports for consumption:[1]					
Unwrought and powders	—	—	44	—	—
Other	685	209	53	334	325
Total	685	209	97	334	325
Exports:[1]					
Unwrought and powders	21	3	51	50	45
Waste and scrap	26	11	103	107	115
Other	31	8	—	—	—
Total	78	22	154	157	160
Consumption, estimated	633	198	46	177	165
Price, metal, dollars per kilogram[2]	6,800	6,990	7,200	7,400	7,500
Net import reliance[3] as a percentage of estimated consumption	100	100	100	100	100

Recycling: None.

Import Sources (2012–15): Germany, 85%; Russia, 13%; and other, 2%.

Tariff: Item	Number	Normal Trade Relations 12–31–16
Unwrought and powders	8112.51.0000	4.0% ad val.
Waste and scrap	8112.52.0000	Free.
Other	8112.59.0000	4.0% ad val.

Depletion Allowance: 14% (Domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: In 2016, the price for thallium metal increased for the seventh consecutive year, reportedly owing to the limited availability of thallium produced in China and the constraint it placed on global supply. In 2016, China maintained its policy of eliminating toll-trading tax benefits on exports of thallium that began in 2006, thus contributing to the reduced supply to markets outside of China. In July 2010, China canceled a 5% value-added-tax rebate on exports of many minor metals, including fabricated thallium products.

Demand for thallium for use in cardiovascular-imaging applications has declined, owing to price increases and superior performance and availability of alternatives, such as the medical isotope technetium-99. A global shortage of technetium-99 from 2009 to 2011 had contributed to an increase in thallium consumption during that time period. Since 2011, consumption of thallium has declined significantly. Small quantities of thallium are used for research.

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THALLIUM

In late 2011, an exploration company in Brazil discovered a substantial thallium deposit in northwest Bahia. According to the company, the deposit was unique because it was the only known occurrence in the world in which thallium had been found with cobalt and manganese. Exploration of the site concluded by yearend 2015 and the company finished testing a hydrometallurgical process that could be used to extract thallium from the ore. Construction of a plant to produce thallium was dependent on obtaining licenses for operation and finding investment partners.

Two of the leading global markets for thallium were glass lenses, prisms, and windows for fiber optics, and optics for digital cameras. The majority of producers of these products were in China, Japan, and the Republic of Korea.

Thallium metal and its compounds are highly toxic materials and are strictly controlled to prevent harm to humans and the environment. Thallium and its compounds can be absorbed into the human body by skin contact, ingestion, or inhalation of dust or fumes. The leading sources of thallium released into the environment are coal-burning powerplants and smelters of copper, lead, and zinc ores. The major sources of thallium in drinking water are ore-processing sites and discharges from electronics, drugs, and glass factories. Under its national primary drinking water regulations for public water supplies, the U.S. Environmental Protection Agency has set an enforceable Maximum Contaminant Level of 2 parts per billion of thallium in drinking water.

World Refinery Production and Reserves:[4] Thallium is produced commercially in only a few countries as a byproduct in the roasting of copper, lead, and zinc ores and is recovered from flue dust. Because most producers withhold thallium production data, global production data are limited. In 2016, global production of thallium was estimated to be less than 10,000 kilograms. China, Kazakhstan, and Russia were believed to be leading producers of primary thallium. Since 2005, substantial thallium-rich deposits have been identified in Brazil, China, Macedonia, and Russia.

World Resources: Although thallium is reasonably abundant in the Earth's crust, estimated at about 0.7 part per million, it exists mostly in association with potassium minerals in clays, granites, and soils, and it is not generally considered to be commercially recoverable from those materials. The major source of recoverable thallium is the trace amounts found in copper, lead, zinc, and other sulfide ores. Quantitative estimates of reserves are not available, owing to the difficulty in identifying deposits where thallium can be extracted economically. Previous estimates of reserves were based on the thallium content of zinc ores. World resources of thallium contained in zinc resources could be as much as 17 million kilograms; most are in Canada, Europe, and the United States. Global resources of coal contain an estimated 630 million kilograms of thallium.

Substitutes: Although other materials and formulations can substitute for thallium in gamma radiation detection equipment and optics used for infrared detection and transmission, thallium materials are presently superior and more cost effective for these very specialized uses. The medical isotope technetium-99 can be used in cardiovascular-imaging applications instead of thallium.

Nonpoisonous substitutes, such as tungsten compounds, are being marketed as substitutes for thallium in high-density liquids for gravity separation of minerals.

[e]Estimated. — Zero.
[1]Thallium content was estimated by the U.S. Geological Survey using official (U.S. Census Bureau) data and unit values for thallium content.
[2]Estimated price of 99.99%-pure granules or rods in 100- to 250-gram or larger lots.
[3]Defined as imports – exports. Consumption and exports of unwrought thallium were from imported material or from a drawdown in unreported inventories.
[4]See Appendix C for resource and reserve definitions and information concerning data sources.