THALLIUM

(Data in kilograms unless otherwise noted)

Domestic Production and Use: There has been no domestic production of thallium since 1981. Small quantities of thallium are consumed annually, but variations in pricing and value data make it difficult to estimate the value of consumption. The primary end uses included the following: radioisotope thallium-201 used for medical purposes in cardiovascular imaging; thallium used as an activator (sodium iodide crystal doped with thallium) in gamma radiation detection equipment; thallium-barium-calcium-copper-oxide high-temperature superconductors; thallium used in lenses, prisms, and windows for infrared detection and transmission equipment; thallium-arsenic-selenium crystal filters used for light diffraction in acousto-optical measuring devices; and thallium used 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:	**2018**	**2019**	**2020**	**2021**	**2022[e]**
Production, refinery	—	—	—	—	—
Imports for consumption:					
Unwrought metal and metal powders	—	—	57	—	—
Waste and scrap	23	27	—	—	13
Other articles	41	38	—	7	—
Exports:					
Unwrought metal and powders	100	290	300	190	—
Waste and scrap	853	133	359	—	—
Other articles	[1]31,400	[1]79,100	580	378	400
Consumption, estimated[2]	64	65	57	7	13
Price, metal, dollars per kilogram[e, 3]	NA	7,600	8,200	8,400	9,400
Net import reliance[4] as a percentage of estimated consumption	NA	NA	NA	NA	NA

Recycling: None.

Import Sources (2018–2021): China, 40%; Russia, 30%; Norway, 14%; United Kingdom, 12%; and Israel, 4%.

Tariff: Item	**Number**	**Normal Trade Relations 12–31–22**
Unwrought and powders	8112.51.0000	4% ad valorem.
Waste and scrap	8112.52.0000	Free.
Other	8112.59.0000	4% ad valorem.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

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THALLIUM

Events, Trends, and Issues: Despite there having been no domestic production of thallium since 1981, exports of thallium have outweighed imports in recent years, which dwindled to near zero in most recent years particularly for unwrought metal and powders. As of September 2022, however, there were no exports of unwrought metal and powders, either a result of inventory depletion or because of reduced worldwide demand. This inventory was thought to be the result of unusually high import quantities from 2008 to 2011, in part because of a global shortage of technetium-99m, which is used as a replacement for thallium in most medical imaging. Data on inventory drawdown of thallium for domestic use were not available. In 2022, estimated exports of thallium articles remained comparable to those in 2021. In 2018 and 2019, reported exports of thallium articles had been unusually high in quantity; these exports had likely been misclassified material. The minor quantities of imports suggests that inventories of thallium remain adequate for domestic needs and for production of articles for export.

The leading global uses for thallium were gamma radiation detection equipment, high-temperature superconductors, infrared optical materials, low-melting glasses, photoelectric cells, and radioisotopes. Demand for thallium for use in medical nuclear-imaging applications declined owing to superior performance and availability of alternatives, such as the medical isotope technetium-99m, although thallium continued to be used in cardiovascular stress testing. Because of thallium's unique properties, new uses for thallium continued to be investigated. In 2022, ongoing research included improvements in scintillators (for radiation detection) that contain thallium as a key component for increased efficiency, and new thallium compounds for use in optoelectronics.

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. 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 thallium in drinking water.

World Refinery Production and Reserves:[5] Thallium is produced commercially in only a few countries as a byproduct recovered from flue dust in the roasting of copper, lead, and zinc ores. Because most producers withhold thallium production data, global production data were limited. In 2022, global production of thallium was estimated to be about 10,000 kilograms. China, Kazakhstan, and Russia were thought to be leading producers of primary thallium. Since 2005, substantial thallium-rich deposits have been identified in Brazil, China, North Macedonia, and Russia. Quantitative estimates of reserves were 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:[5] 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 trace amounts found in sulfide ores of copper, lead, zinc, and other metallic elements. As such, world resources of thallium are adequate to supply world requirements.

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-99m can be used in cardiovascular-imaging applications instead of thallium. Nontoxic substitutes, such as tungsten compounds, are being marketed as substitutes for thallium in high-density liquids for gravity separation of minerals.

[e]Estimated. NA Not available. — Zero.

[1]Includes material that may have been misclassified.

[2]Estimated to be equal to imports.

[3]Estimated price of 99.99%-pure granules in 100-gram lots.

[4]Defined as imports – exports. Consumption and exports of unwrought thallium were from imported material or from a drawdown in unreported inventories.

[5]See Appendix C for resource and reserve definitions and information concerning data sources.