

THALLIUM

(Data in kilograms of thallium content, unless otherwise noted)

Domestic Production and Use: Thallium is a byproduct metal recovered in some countries from flue dusts and residues collected in the smelting of copper, zinc, and lead ores. Although thallium was contained in ores mined or processed in the United States, it has not been recovered domestically since 1981. Consumption of thallium metal and its compounds continued for most of their established end uses. These uses included a semiconductor material for selenium rectifiers, an activator in gamma radiation detection equipment, an electrical resistance component in infrared radiation detection and transmission equipment, and a crystalline filter for light diffraction in acousto-optical measuring devices. Other uses included an alloying component with mercury for low-temperature measurements, an additive in glass to increase its refractive index and density, a catalyst or intermediate in the synthesis of organic compounds, and a high-density liquid for sink-float separation of minerals. Also, the use of radioactive thallium compounds for medical purposes in cardiovascular imaging continued in 2003.

| Salient Statistics—United States: | 1999 | 2000 | 2001 | 2002 | 2003^e |
|---|-------------|-------------|-------------|-------------|-------------------------|
| Production, mine | — | — | — | — | — |
| Imports for consumption ¹ | 838 | 100 | 2,110 | 307 | 250 |
| Exports | NA | NA | NA | NA | NA |
| Consumption ² | 380 | 300 | 800 | 500 | 500 |
| Price, metal, dollars per kilogram ³ | 1,295 | 1,295 | 1,295 | 1,250 | 1,300 |
| Net import reliance ⁴ as a percentage of estimated consumption | 100 | 100 | 100 | 100 | 100 |

Recycling: None.

Import Sources (1999-2002): Belgium, 81%; Canada, 13%; France, 3%; Russia, 2%; and United Kingdom, 1%.

| Tariff: Item | Number | Normal Trade Relations⁵ 12/31/03 |
|--|---------------|--|
| Unwrought; powders; scrap (until 12/31/01) | 8112.91.6000 | 4.0% ad val. |
| Unwrought and powders (starting 01/01/02) | 8112.51.0000 | 4.0% ad val. |
| Waste and scrap (starting 01/01/02) | 8112.52.0000 | Free. |
| Other (starting 01/01/02) | 8112.59.0000 | 4.0% ad val. |

Depletion Allowance: 14% (Domestic and foreign).

Government Stockpile: None.

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Events, Trends, and Issues: Research and development activities of both a basic and applied nature were conducted during 2003 to improve and expand the use of thallium. These activities included the development of high-temperature superconducting materials for such applications as magnetic resonance imaging, storage of magnetic energy, magnetic propulsion, and electric power generation and transmission. The development of improved methods for manufacturing high-temperature superconductor tapes and films, such as thallium-barium-calcium-copper oxides, also received attention during the year. These tapes and films could be significant energy saving devices when applied in, for example, ultrafast computer and power transmission systems. Further use of radioactive thallium in clinical diagnostic applications, including cardiovascular and oncological imaging, also was studied during 2003. In addition, dipyrindamole-thallium imaging continued to be a useful preoperative procedure for assessing long-term cardiac risks in patients with coronary artery disease or diabetes who are undergoing peripheral vascular surgery.

Thallium metal and its compounds are highly toxic materials and are strictly controlled to prevent a threat 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. In 2003, the U.S. Environmental Protection Agency (EPA) continued health assessments on thallium and several other metals and chemicals for inclusion in the agency's Integrated Risk Information System database. Further scientific information on health effects that may result from exposure to these substances was requested from the public in order to complete the assessments. The assessment for thallium was expected to be completed in 2005. The EPA also initiated studies at its National Risk Management Research Laboratory on thallium removal from mine wastewaters. The U.S. Department of Health and Human Services, Food and Drug Administration, issued a guidance document announcing an approved drug for treatment of internal bodily contamination by radioactive or nonradioactive thallium. The drug, a form of industrial and artists' pigment (prussian blue), effectively increases the rate of elimination of thallium from the body by interrupting the process of thallium reabsorption into the gastrointestinal tract from the intestines.

World Mine Production, Reserves, and Reserve Base:⁶

| | Mine production | | Reserves ⁷ | Reserve base ⁷ |
|------------------------------|-----------------|---------------|-----------------------|---------------------------|
| | <u>2002</u> | <u>2003</u> | | |
| United States | (8) | (8) | 32,000 | 120,000 |
| Other countries | <u>15,000</u> | <u>15,000</u> | <u>350,000</u> | <u>530,000</u> |
| World total (may be rounded) | 15,000 | 15,000 | 380,000 | 650,000 |

World Resources: World resources of thallium contained in zinc resources total about 17 million kilograms; most are located in Canada, Europe, and the United States. An additional 630 million kilograms is in world coal resources. The average thallium content of the Earth's crust has been estimated at 0.7 part per million.

Substitutes: While other light-sensitive materials can substitute for thallium and its compounds in specific electronic applications, ample supplies of thallium discourage development of substitute materials.

⁶Estimated. NA Not available. — Zero.

¹Unwrought; waste and scrap; powders, including thallium contained in compounds.

²Based on reported imports and estimated drawdown of private stocks.

³Estimated price of 99.999%-pure granules in 100-gram lots.

⁴Defined as imports – exports + adjustments for Government and industry stock changes.

⁵By the North American Free Trade Agreement, there is no tariff for Canada or Mexico.

⁶Estimates are based on thallium content of zinc ores.

⁷See Appendix C for definitions.

⁸Thallium contained in mined base-metal ores, estimated at 450 to 500 kilograms per year, is separated from the base metals but not extracted for commercial use.