

## 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 was not recovered domestically in 2001. Consumption of thallium metal and its compounds continued in 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 was continued in 2001.

| <b>Salient Statistics—United States:</b>                                    | <b>1997</b> | <b>1998</b> | <b>1999</b> | <b>2000</b> | <b>2001<sup>e</sup></b> |
|---|-------------|-------------|-------------|-------------|-------------------------|
| Production, mine <sup>1</sup>   | —           | —           | —           | —           | —                       |
| Imports for consumption <sup>2</sup>  | 168         | 104         | 838         | 100         | 1,900                   |
| Exports   | NA          | NA          | NA          | NA          | NA                      |
| Consumption <sup>e</sup>  | 300         | 300         | 380         | 300         | 800                     |
| Price, metal, dollars per kilogram <sup>3</sup>                             | 1,280       | 1,280       | 1,295       | 1,295       | 1,295                   |
| Net import reliance <sup>4</sup> as a percentage of<br>apparent consumption | 100         | 100         | 100         | 100         | 100                     |

**Recycling:** None.

**Import Sources (1997-2000):** Belgium, 47%; Canada, 35%; Germany, 12%; United Kingdom, 4%; and France, 2%.

| <b>Tariff: Item</b>                 | <b>Number</b> | <b>Normal Trade Relations<sup>5</sup><br/>12/31/01</b> |
|-------------------------------------|---------------|--|
| Unwrought, waste and scrap, powders | 8112.91.6000  | 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 2001 to improve and expand the use of thallium. These activities focused principally on 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. Particular emphasis was directed toward the development of more efficient, smaller, lighter weight and less expensive superconductive wire or tape for electric power transmission. Consideration continued to be given to the use of a thallium-oxide superconductor in these electric power transmission components. Further use of radioactive thallium in clinical diagnostic applications, including cardiovascular and oncological imaging, also was studied during 2001.

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. Special concern regarding the toxicity of thallium was evident in 2001 after workers at a North American lead smelter were discovered to have been exposed to elevated levels of thallium. The workers were conducting routine maintenance to remove scale from inside one of the boilers at the facility. Measures were taken immediately by the company to correct procedural deficiencies that allowed the workers to be exposed. Medical experts believed that there would be no long-term adverse health effects to the workers as a result of this incident of exposure to thallium.

### **World Mine Production, Reserves, and Reserve Base:**<sup>6</sup>

|                              | Mine production |               | Reserves <sup>7</sup> | Reserve base <sup>7</sup> |
|------------------------------|-----------------|---------------|-----------------------|---------------------------|
|                              | <u>2000</u>     | <u>2001</u>   |                       |                           |
| United States <sup>1</sup>   | —               | —             | 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.

<sup>6</sup>Estimated. NA Not available. — Zero.

<sup>1</sup>Thallium 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.

<sup>2</sup>Unwrought; waste and scrap; powders, including thallium contained in compounds.

<sup>3</sup>Estimated price of 99.999%-pure granules in 100-gram lots.

<sup>4</sup>Defined as imports - exports + adjustments for Government and industry stock changes.

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

<sup>6</sup>Estimates, based on thallium content of zinc ores.

<sup>7</sup>See Appendix C for definitions.