THALLIUM

By Thomas O. Llewellyn

Mr. Llewellyn, a physical scientist with over 30 years of industry and U.S. Bureau of Mines experience, has been the commodity specialist for thallium since 1987. Domestic survey data were prepared by Carolyn F. Crews, statistical assistant.

In 1991, domestic demand for thallium metal was met by imports. Thallium is a trace element with an estimated average abundance of 2.2 parts per million in zinc sulfide ores and is a byproduct recovered from fluie dust and residues collected in the smelting of zinc as well as copper and lead. There are a number of rare thallium minerals found in nature, which have no commercial importance as sources of thallium metal.

BACKGROUND

Current Research

A thallium-copper oxide superconductor, said to have a very high superconductivity transition temperature, was reportedly developed at the Superconductivity Research Laboratory, Tokyo, Japan.\(^1\) Researchers in California designed a practical X-ray laser using energized atoms of thallium. The X-ray laser beam can penetrate living tissue like conventional X-rays, but it can also produce three-dimensional pictures of proteins as they react inside living cells.\(^2\)

Operating Factors

Thallium metal and its compounds are highly toxic; they should be handled with extreme care and require the use of rubber gloves. It can be absorbed into the human body by skin contact, ingestion, or by inhaling dust or fumes. The element is not quickly eliminated from the body; therefore, absorption of subtoxic quantities eventually may accumulate to a toxic level.

ANNUAL REVIEW

Production

Although thallium was contained in ores mined or processed in the United States, it was not recovered domestically as a marketable product in 1991.

Consumption and Uses

Based on import data and discussions with metal traders, the domestic consumption of thallium in 1991 was estimated to be 850 kilograms, about 21% higher than that in 1990.

Thallium was used in superconductivity research, gamma radiation-detection equipment, additives for changing the refractive index and density of glass, low temperature mercury-thallium alloy switches, high-density liquids, alloys, photosensitive devices, and radioactive isotopes for cardiovascular diagnostic procedures.

Markets and Prices

Thallium metal was sold at various prices during the year according to its purity. Metal traders reported that the average price of thallium metal in 100-kilogram lots was $190 per kilogram for 99.99%–pure thallium metal. The average value per kilogram of unwrought thallium metal and waste and scrap imported into the United States was estimated to be about $181 per kilogram.

Foreign Trade

In 1991, thallium materials were imported from Belgium, Canada, and the United Kingdom. However, Belgium remained the principal source of imported thallium materials. Since January 1, 1990, the import duty for unwrought thallium and waste and scrap (Harmonized code 8112.91.6000) has been 5.5% ad valorem for most favored nations (MFN) and 25% ad valorem for non-MFN.

Thallium producers are granted a depletion allowance of 14% on both domestic and foreign production.

World Review

World production data for thallium were not available. The U.S. reserves in zinc ores were estimated to be about 32,000 kilograms. Rest-of-the-world reserves were estimated to be 345,000 kilograms of thallium.

OUTLOOK

The United States is not expected to resume recovery of thallium within the next 5 years. The toxicity of thallium is the factor that continues to influence domestic dependence on foreign sources for its supply.

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**TABLE 1**

**U.S. IMPORTS FOR CONSUMPTION OF THALLIUM, BY COUNTRY**

<table>
<thead>
<tr>
<th></th>
<th>Gross weight (kilograms)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>450</td>
<td>61,482</td>
</tr>
<tr>
<td>1991:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>886</td>
<td>131,104</td>
</tr>
<tr>
<td>Canada</td>
<td>27</td>
<td>38,150</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>100</td>
<td>14,600</td>
</tr>
<tr>
<td>Total</td>
<td>1,013</td>
<td>183,854</td>
</tr>
</tbody>
</table>

Source: Bureau of the Census.