

## GERMANIUM

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

**Domestic Production and Use:** The value of domestic refinery production of germanium, based upon the 2000 producer price, was about \$22 million. Industry-generated scrap, imported concentrates, and processed residues from certain domestic base metal ores were the feed materials for the production of refined germanium in 2000. The domestic industry consisted of three germanium refineries, one each in New York, Oklahoma, and Pennsylvania, and two base metal mining operations, one in Tennessee and the other in Alaska. Both of the mining companies supplied domestic and export markets with germanium-bearing materials generated from the mining of zinc ores. The major end uses for germanium, worldwide, were estimated to be almost the same as for 1999: fiber-optic systems, 50%; polymerization catalysts, 20%; infrared optics, 15%; electronics/solar electrical applications, 10%; and other uses (phosphors, metallurgy, and chemotherapy), 5%.

<b>Salient Statistics—United States:</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000<sup>e</sup></b>
Production, refinery <sup>e</sup>	18,000	20,000	22,000	20,000	19,000
Total imports <sup>1</sup>	27,500	23,700	14,600	12,400	10,000
Exports	NA	NA	NA	NA	NA
Consumption <sup>e</sup>	25,000	28,000	28,000	28,000	28,000
Price, producer, yearend, dollars per kilogram:					
Zone refined	2,000	1,475	1,700	1,400	1,150
Dioxide, electronic grade	1,300	950	1,100	900	750
Stocks, producer, yearend	NA	NA	NA	NA	NA
Employment, plant, <sup>2</sup> number <sup>e</sup>	120	115	100	85	85
Net import reliance <sup>3</sup> as a percent of apparent consumption	NA	NA	NA	NA	NA

**Recycling:** More than half of the metal used during the manufacture of most electronic and optical devices is routinely recycled as new scrap. Worldwide, about 25% of the total germanium consumed was produced from recycled materials. As a result of the low unit use of germanium in various devices, little germanium returns as old scrap.

**Import Sources (1996-99):<sup>4</sup>** Russia, 33%; Belgium, 24%; China, 19%; United Kingdom, 8%; and other, 16%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Normal Trade Relations 12/31/00</b>
Germanium oxides	2825.60.0000	3.7% ad val.
Waste and scrap	8112.30.3000	Free.
Metal, unwrought	8112.30.6000	2.6% ad val.
Metal, wrought	8112.30.9000	4.4% ad val.

**Depletion Allowance:** 14% (Domestic and foreign).

### **Government Stockpile:**

#### **Stockpile Status—9-30-00<sup>5</sup>**

<b>Material</b>	<b>Uncommitted inventory</b>	<b>Committed inventory</b>	<b>Authorized for disposal</b>	<b>Disposal plan FY 2000</b>	<b>Disposals FY 2000</b>
Germanium	48,561	750	48,561	8,000	2,017

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**Events, Trends, and Issues:** World refinery production of germanium remained steady in 2000. The recycling of scrap continued to be a significant factor. The only releases from national government stockpiles were from the United States. Lack of world demand for satellite applications continued, as major projects remained stalled. This lack of demand was offset by increased consumption in fiber optics and polyethylene terephthalate (PET) bottles. More than one-half of total world demand was from the fiber optics sector.

Germanium has little or no effect upon the environment because it usually occurs only as a trace element in ores and carbonaceous materials and is used in very small quantities in commercial applications.

**World Refinery Production, Reserves, and Reserve Base:**

	Refinery production <sup>e</sup>		Reserves <sup>6</sup>	Reserve base <sup>6</sup>
	<u>1999</u>	<u>2000</u>		
United States	20,000	19,000	450,000	500,000
Other countries	<u>38,000</u>	<u>39,000</u>	<u>NA</u>	<u>NA</u>
World total (rounded)	58,000	58,000	NA	NA

**World Resources:** The available resources of germanium are associated with certain zinc and lead-zinc-copper sulfide ores. Significant amounts of germanium are contained in ash and flue dust generated in the combustion of certain coals for power generation.

**Substitutes:** Less expensive silicon can be substituted for germanium in certain electronic applications. Certain bimetallic compounds of gallium, indium, selenium, and tellurium can also be substituted for germanium. Germanium is more reliable than competing materials in some high-frequency and high-power electronics applications and is more economical as a substrate for some light-emitting diode applications. In infrared guidance systems, zinc selenide and germanium glass substitute for germanium metal but at the expense of performance.

<sup>e</sup>Estimated. NA Not available.

<sup>1</sup>Gross weight of wrought and unwrought germanium and waste and scrap. Does not include imports of germanium dioxide and other germanium compounds for which data are not available.

<sup>2</sup>Employment related to primary germanium refining is indirectly related to zinc refining.

<sup>3</sup>Defined as imports - exports + adjustments for Government and industry stock changes.

<sup>4</sup>Total imports from republics of the former Soviet Union (Estonia, Russia, and Ukraine) accounted for 38% of the 1996-99 imports.

<sup>5</sup>See Appendix B for definitions.

<sup>6</sup>See Appendix C for definitions.