

GERMANIUM

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

Domestic Production and Use: The value of domestic refinery production of germanium, based on the 1999 producer price, was about \$28 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 1999. 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 fiber-optic systems, 50%; polymerization catalysts, 20%; infrared optics, 15%; electronics/solar electrical applications, 10%; and other uses (phosphors, metallurgy, and chemotherapy), 5%.

Salient Statistics—United States:	1995	1996	1997	1998	1999^e
Production, refinery ^e	10,000	18,000	20,000	22,000	20,000
Total imports ¹	16,200	27,500	23,700	14,610	15,000
Exports	NA	NA	NA	NA	NA
Consumption ^e	27,000	25,000	28,000	28,000	28,000
Price, producer, yearend, dollars per kilogram:					
Zone refined	1,375	2,000	1,475	1,700	1,400
Dioxide, electronic grade	880	1,300	950	1,100	900
Stocks, producer, yearend	NA	NA	NA	NA	NA
Employment, plant, ² number ^e	110	120	115	100	85
Net import reliance ³ 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 (1995-98):⁴ Russia, 34%; Belgium, 25%; China, 15%; United Kingdom, 14%; and other, 12%.

Tariff: Item	Number	Normal Trade Relations 12/31/99
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: 15% (Domestic and foreign).

Government Stockpile:

Stockpile Status—9-30-99⁵

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 1999	Disposals FY 1999
Germanium	50,567	865	50,567	8,000	4,854

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Events, Trends, and Issues: World refinery production of germanium increased in 1999, with slightly larger amounts brought to market by Canada and China. Output from Russia and Ukraine remained low. The recycling of scrap continued to be a significant factor. The only releases from national government stockpiles were from the United States. Decreases in world demand for polyethylene terephthalate (PET) and satellite applications resulted in a world oversupply despite expected increases in demand from fiber optics producers. One-half of total world demand is 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 ^e		Reserves ⁶	Reserve base ⁶
	1998	1999		
United States	22,000	20,000	450,000	500,000
Other countries	34,000	38,000	NA	NA
World total	56,000	58,000	NA	NA

World Resources: The available resources of germanium are associated with certain zinc and lead-zinc-copper sulfide ores. Worldwide germanium resources would increase substantially if germanium were to be recovered from ash and flue dust generated in the burning 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 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.

^eEstimated. NA Not available.

¹Gross 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.

²Employment related to primary germanium refining is indirectly related to zinc refining.

³Defined as imports - exports + adjustments for Government and industry stock changes.

⁴Total imports from republics of the Former Soviet Union (Estonia, Lithuania, Russia, and Ukraine) account for 38.5% of the 1995-98 imports.

⁵See Appendix B for definitions.

⁶See Appendix C for definitions.