GERMANIUM[1]

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

Domestic Production and Use: The value of domestic refinery production of germanium, based upon the 2002 producer price, was $17 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 2002. The domestic industry was based on two zinc mining operations, one in Tennessee and the other in Alaska. The mining companies at these operations supplied domestic and export markets with germanium-bearing materials generated from the processing of zinc ores. The germanium refinery in Utica, NY, produced germanium tetrachloride for optical fiber production. The refinery in Oklahoma doubled its production of germanium tetrachloride production in response to the growing demand expected in the fiber optics industry. The major end uses for germanium, worldwide, were estimated to be higher in fiber optics than for 2001—fiber-optic systems, 60%; polymerization catalysts, 15%; infrared optics, 15%; electronics/solar electrical applications, 5%; and other (phosphors, metallurgy, and chemotherapy), 5%.

Salient Statistics—United States:	1998	1999	2000	2001	2002[e]
Production, refinery[e]	22,000	20,000	23,000	20,000	20,000
Total imports[2]	14,600	12,400	8,220	8,240	8,250
Exports	NA	NA	NA	NA	NA
Consumption[e]	28,000	28,000	28,000	28,000	28,000
Price, producer, yearend, dollars per kilogram:					
Zone refined	1,700	1,400	1,250	890	850
Dioxide, electronic grade	1,100	900	800	575	500
Stocks, producer, yearend	NA	NA	NA	NA	NA
Employment, plant,[3] number[e]	100	85	90	90	85
Net import reliance[4] as a percentage of estimated consumption	NA	NA	NA	NA	NA

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

Import Sources (1998-2001):[5] China, 35%; Belgium, 32%; Taiwan, 10%; Russia, 10%; and other, 13%.

Tariff: Item	Number	Normal Trade Relations 12/31/02
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—9-30-02[6]

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 2002	Disposals FY 2002
Germanium	42,186	—	42,186	8,000	620

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GERMANIUM

Events, Trends, and Issues: Domestic refinery production of germanium remained the same as in 2001; world output also remained the same. Recycling of new scrap continued to grow and remained a significant supply factor. Optical fiber manufacturing stabilized owing to an upturn in the general economy and telecommunications in particular. Higher recycling rates and declining polyethylene terephthalate (PET) plastics demand due to further worsening of economic conditions in Asia caused germanium oxide (a catalyst used in the production of PET) stocks to increase. However, increases in demand for infrared applications in security, new uses as catalysts, and the potential replacement of gallium arsenide devices by silicon-germanium in wireless telecommunications portend a bright long-range future for germanium.

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: Most U.S. reserves and reserve base of germanium are located in the zinc deposits of the Red Dog district in of Alaska, with lesser amounts in the zinc ores of central Tennessee. The quantities are company proprietary data and are not available for publication.

	Refinery production[e]		Reserves[7]	Reserve base[7]
	2001	2002		
United States	20,000	20,000	NA	NA
Other countries	48,000	48,000	NA	NA
World total	68,000	68,000	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. Some 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.

[e]Estimated. NA Not available. — Zero.

[1]Prepared by Earle B. Amey.

[2]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.

[3]Employment related to primary germanium refining is indirectly related to zinc refining.

[4]Defined as imports - exports + adjustments for Government and industry stock changes.

[5]Total imports from republics of the former Soviet Union (Russia and Ukraine) accounted for 14% of the imports from 1998 to 2001.

[6]See Appendix B for definitions.

[7]See Appendix C for definitions.