

GALLIUM

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

Domestic Production and Use: No domestic primary gallium recovery was reported in 2001. Two companies in Oklahoma and Utah recovered and refined gallium from scrap and impure gallium metal. Imports of gallium, which supplied most of U.S. gallium consumption, were valued at about \$29 million. Gallium arsenide (GaAs) components represented about 98% of domestic gallium consumption. About 32% of the gallium consumed was used in optoelectronic devices, which include light-emitting diodes (LEDs), laser diodes, photodetectors, and solar cells. Integrated circuits represented 66% of gallium demand. The remaining 2% was used in research and development, specialty alloys, and other applications. Optoelectronic devices were used in areas such as consumer goods, medical equipment, industrial components, telecommunications, and aerospace applications. Integrated circuits were used in defense applications and high-performance computers.

Salient Statistics—United States:	1997	1998	1999	2000	2001^e
Production, primary	—	—	—	—	—
Imports for consumption	19,100	26,300	24,100	39,400	32,000
Exports	NA	NA	NA	NA	NA
Consumption:					
Reported	23,600	26,900	29,800	39,900	30,000
Apparent	NA	NA	NA	NA	NA
Price, yearend, dollars per kilogram, 99.99999%-pure	595	595	640	640	640
Stocks, producer, yearend	NA	NA	NA	NA	NA
Employment, refinery, number ^e	20	20	20	20	20
Net import reliance ¹ as a percentage of apparent consumption	NA	NA	NA	NA	NA

Recycling: Old scrap, none. Substantial quantities of new scrap generated in the manufacture of GaAs-based devices were reprocessed.

Import Sources (1997-2000): France, 48%; Kazakhstan, 17%; Russia, 14%; Hungary, 5%; and other, 16%.

Tariff: Item	Number	Normal Trade Relations 12/31/01
Gallium metal	8112.91.1000	3.0% ad val.
Gallium arsenide wafers, undoped	2851.00.0010	2.8% ad val.
Gallium arsenide wafers, doped	3818.00.0010	Free.

Depletion Allowance: Not applicable.

Government Stockpile: None.

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Events, Trends, and Issues: In early 2001, world gallium supplies remained tight, and prices continued to escalate. By March, press reports indicated that prices for high-purity gallium had reached \$2,500 per kilogram on the spot market. By midyear, however, spot prices had dropped to about \$1,000 per kilogram, still higher than the average selling price of \$500 to \$600 per kilogram. The slowdown in the U.S. economy resulted in a decline in the cellular telephone market, which had been principally responsible for the growth in gallium consumption in the past few years. Although there is some uncertainty about the potential demand for new cellular telecommunications technology, and ultimately demand for GaAs components in this application, gallium supplies are expected to ease as a 100-metric-ton-per-year gallium extraction facility is due on-stream in Australia in 2002. Even though the market for wireless applications declined somewhat during 2001, some market analysts predicted that the demand for wireless communications equipment will continue to grow. One estimate was that the cellular integrated circuit market would double in revenue between 2001 and 2006 as consumers upgrade their current cellular handsets to ones that provide improved data services.

Imports continued to supply almost all U.S. demand for gallium and decreased from those in 2000 because of the slowdown in the wireless communications industry. Using partial-year data, China, France, Russia, and the United Kingdom were the principal U.S. gallium suppliers in 2001.

Consumption of high-purity gallium in Japan also was projected to increase in 2001. Total gallium consumption was projected to increase 17% to 185 metric tons. Domestic production of 22 metric tons, imports of 69 metric tons, and scrap recycling of 94 metric tons were the components of Japanese consumption. One Japanese gallium refining firm announced that it would construct a 40-metric-ton-per-year gallium refining facility in Shanghai, China, beginning in the fall of 2001. This gallium is expected to be exported to Japan for use by firms there.

A Canadian firm reported a discovery of a gallium deposit in Humboldt County, NV, that contains zones grading as high as 222.6 grams per metric ton gallium, with an average of 82.5 grams per metric ton gallium. The company planned to begin drilling the site in October to delineate the resource further, with plans for eventual recovery of the gallium and other minerals in the deposit.

World Production, Reserves, and Reserve Base: Data on world production of primary gallium are unavailable because data on the output of the few producers are considered to be proprietary. However, in 2001, world primary production was estimated to be about 100 metric tons, the same as that in 2000, with Germany, Japan, Kazakhstan, and Russia being the largest producers. Countries with smaller output were China, Hungary, Slovakia, and Ukraine. Refined gallium production was estimated to be about 110 metric tons. France was the largest producer of refined gallium, using as feed material crude gallium produced in Germany. Japan and the United States were the other large gallium-refining countries. Gallium was recycled from new scrap in Germany, Japan, the United Kingdom, and the United States.

Gallium occurs in very small concentrations in many rocks and in ores of other metals. Most gallium was produced as a byproduct of treating bauxite, and the remainder was produced from zinc-processing residues. Only part of the gallium present in bauxite and zinc ores was recoverable, and the factors controlling the recovery were proprietary. Therefore, a meaningful estimate of current reserves cannot be made. The world bauxite reserve base is so large that much of it will not be mined for many decades; hence, most of the gallium in the bauxite reserve base can be considered to have only long-term availability.

World Resources: Assuming that the average content of gallium in bauxite is 50 parts per million (ppm), U.S. bauxite resources, which are mainly subeconomic deposits, contain approximately 15 million kilograms of gallium. About 2 million kilograms of this metal are present in the bauxite deposits in Arkansas. Some domestic zinc ores contain as much as 50 ppm gallium and, as such, could be a significant resource. World resources of gallium in bauxite are estimated to exceed 1 billion kilograms, and a considerable quantity could be present in world zinc reserves. The foregoing estimates apply to total gallium content; only a small percentage of this metal in bauxite and zinc ores is economically recoverable.

Substitutes: Liquid crystals made from organic compounds are used in visual displays as substitutes for LEDs. Researchers are also working to develop organic-based LEDs that may compete with GaAs in the future. Indium phosphide components can be substituted for GaAs-based infrared laser diodes in some specific-wavelength applications, and GaAs competes with helium-neon lasers in visible laser diode applications. Silicon is the principal competitor for GaAs in solar cell applications. GaAs-based integrated circuits are used in many defense-related applications because of their unique properties, and there are no effective substitutes for GaAs in these applications.

^eEstimated. NA Not available. — Zero.

^fDefined as imports - exports + adjustments for Government and industry stock changes.