GALLIUM

(Data in kilograms of gallium content unless otherwise noted)

Domestic Production and Use: No domestic primary gallium recovery was reported in 2006. One company in Utah recovered and refined gallium from scrap and impure gallium metal, and one company in Oklahoma refined gallium from impure metal. Imports of gallium, which supplied most of U.S. gallium consumption, were valued at about $5.5 million. Gallium arsenide (GaAs) and gallium nitride (GaN) electronic components represented about 98% of domestic gallium consumption. About 63% of the gallium consumed was used in integrated circuits. Optoelectronic devices, which include light-emitting diodes (LEDs), laser diodes, photodetectors, and solar cells, represented 22% of gallium demand. The remaining 15% was used in research and development, specialty alloys, and other applications. Optoelectronic devices were used in areas such as aerospace, consumer goods, industrial equipment, medical equipment, and telecommunications. Integrated circuits were used in defense applications, high-performance computers, and telecommunications.

Salient Statistics—United States:	2002	2003	2004	2005	2006[e]
Production, primary	—	—	—	—	—
Imports for consumption	13,100	14,300	19,400	15,800	17,500
Exports	NA	NA	NA	NA	NA
Consumption:					
Reported	18,600	20,100	21,500	18,700	20,000
Apparent	NA	NA	NA	NA	NA
Price, yearend, dollars per kilogram, 99.99999%-pure[1]	530	411	550	538	500
Stocks, producer, yearend	NA	NA	NA	NA	NA
Employment, refinery, number[e]	20	20	20	20	20
Net import reliance[2] as a percentage of reported consumption[e]	99	99	99	99	99

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

Import Sources (2002-05): China, 37%; Japan, 17%; Ukraine, 12%; Russia, 10%; and other, 24%.

Tariff: Item	Number	Normal Trade Relations 12-31-06
Gallium metal	8112.92.1000	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.

Events, Trends, and Issues: Imports of gallium and GaAs wafers continued to supply almost all U.S. demand for gallium and were higher than those in 2005.

Prices for low-grade (99.99%-pure) gallium were relatively stable throughout 2006. After an increase at the end of 2005 to about $400 per kilogram, prices for gallium from China fell to about $350 per kilogram in February. Prices fell slightly in March to a range of $330 to $340 per kilogram, remaining at this level throughout the rest of the year.

Japan's supply of gallium was expected to increase slightly from 139 metric tons in 2005 to 140 metric tons in 2006. Production was estimated to be 8 metric tons; recycled scrap, 90 metric tons; and imports, 42 metric tons. Included in the imports was 9.6 metric tons of 99%-pure gallium from the Republic of Korea and Taiwan; this is most likely recycled scrap.

In May, the gallium recycler in Utah and a gallium recycler in the United Kingdom jointly purchased the 35,000-kilogram-per-year gallium production facility in Stade, Germany. The facility will operate as a joint venture with each company receiving 50% of the output; the plant reportedly was producing about 12,000 kilograms per year. In August, the United Kingdom firm announced that it completed construction of a gallium refining plant in Shenzhen, Guangdong Province, China. Output from this plant would be targeted toward the Asian markets. No capacity was given for the new plant. Production from the Stade plant had been refined at a plant in France, which was owned by the previous owner of the Stade facility.

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GALLIUM

A zinc producer in China announced plans to recover gallium and germanium from concentrate processed at the plant. Estimated production capacity for each metal would be about 50 metric tons per year. No timetable for project completion was given.

In anticipation of a surge in demand for semi-insulating GaAs substrates, primarily for cellular telephone handsets, companies increased production. Market analysts predicted that after a 16% increase in market value from 2004 to 2005, GaAs demand for advanced cellular telephone handsets would continue to be strong until at least 2008. Separate market analysis of the handset market forecast a growth of 18% in sales from 2005 to 2006, based on 2 quarters of sales figures. In addition to power amplifiers (the principal use of GaAs components in handsets), the market for GaAs-base LEDs in cellular telephone applications also was expected to continue to grow in areas such as keypad backlighting and camera flashes. Even with growth in GaAs components predicted, GaAs manufacturers continued to consolidate, leading to fewer companies marketing GaAs in the future.

The market for blue, green, and white GaN-base LEDs reached $3.2 billion in 2005, with white LEDs accounting for more than 50% of the total GaN LED market. Future high-growth GaN devices include high-power LEDs for lighting as well as deep-ultraviolet emitters and laser diodes. The latter was expected to be used in the next generation of optical storage technology.

Interest in GaAs-base solar cells has picked up in 2006. Several firms received contracts for terrestrial solar cells, which will be used to supply energy to homes in the United States and Australia. One U.S. firm received an extension of an existing contract for satellite solar cells and two contracts from European customers for terrestrial solar cells.

World Production, Reserves, and Reserve Base:[3] 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 2006, world primary production was estimated to be about 69 metric tons, the same as that in 2005. China, Germany, Japan, and Ukraine were the leading producers; countries with smaller output were Hungary, Kazakhstan, Russia, and Slovakia. Refined gallium production was estimated to be about 99 metric tons; this figure includes some scrap refining. France was the leading 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. World primary gallium production capacity in 2006 was estimated to be 160 metric tons; refinery capacity, 152 tons; and recycling capacity, 73 tons.

Gallium occurs in very small concentrations in ores of other metals. Most gallium is produced as a byproduct of treating bauxite, and the remainder is produced from zinc-processing residues. Only part of the gallium present in bauxite and zinc ores is recoverable, and the factors controlling the recovery are proprietary. Therefore, an estimate of current reserves that is comparable to the definition of reserves of other minerals 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 cannot be considered to be available in the short term.

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 is 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 also are working to develop organic-base LEDs that may compete with GaAs in the future. Indium phosphide components can be substituted for GaAs-base 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-base 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. GaAs in heterojunction bipolar transistors is being challenged in some applications by silicon-germanium.

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

[1]Estimated average values of U.S. imports for 99.9999%- and 99.99999%-pure gallium.

[2]Defined as imports – exports + adjustments for Government and industry stock changes.

[3]See Appendix C for definitions.