INDIUM

(Data in metric tons, unless otherwise noted)

Domestic Production and Use: Indium was not recovered from ores in the United States in 2003. Two companies, one in New York and the other in Rhode Island, produced indium metal and indium products by upgrading lower grade imported indium metal. High-purity indium shapes, alloys, and compounds were also produced from imported indium by several additional firms.

Thin-film coatings, which are used in applications such as for electroluminescent lamps and for liquid crystal displays (LCDs) in flat panel video screens, continued to be the largest end use. Indium semiconductor compounds were used in infrared detectors, high-speed transistors, and high-efficiency photovoltaic devices. The estimated distribution of uses in 2003 indicated an increase in the application for coatings that was offset by the reduction in the uses for solder and alloys and for electrical components: Coatings, 65%; solders and alloys, 15%; electrical components and semiconductors, 10%; and research and other, 10%. The estimated value of primary indium metal consumed in 2003, based upon the annual average price, was about $14.8 million.

Salient Statistics—United States:	**1999**	**2000**	**2001**	**2002**	**2003[e]**
Production, refinery	—	—	—	—	—
Imports for consumption[1]	77	69	79	112	115
Exports	NA	NA	[e]10	[e]10	NA
Consumption[e]	52	55	65	85	90
Price, annual average, dollars per kilogram (99.97% indium)	303	188	120	97	175
Stocks, producer, yearend	NA	NA	NA	NA	NA
Employment, number	NA	NA	NA	NA	NA
Net import reliance[2] as a percentage of estimated consumption	100	100	100	100	100

Recycling: Recent trends in indium price combined with the curtailment of primary refining capacity have added an extra incentive to the recovery of secondary indium. Sustained prices in the $160 to $200 per kilogram range will encourage increased recycling.

In the United States, only small amounts of new indium scrap were recycled in 2003. This is because the infrastructure for collection of indium-containing products is not well established in the United States and because the recent low price of primary indium has not economically warranted its development. Recycling of indium could expand significantly in the United States if the price of indium continues to increase. About 60% of the indium-tin oxide scrap could be reused should the price of indium warrant increased recycling.

This can be compared with Japan where the decline in domestic zinc refining has stimulated an aggressive recycling program expected to make up for any shortfalls in domestic production. For example, in 2002, 155 tons of indium, or almost 45% of Japanese indium consumption, was derived from secondary sources, mostly of domestic origin. This compares with the 55 tons of primary indium that Japan produced.

Import Sources (1999-2002):[1] China, 46%; Canada, 27%; France, 8%; Russia, 7%; and other, 12%.

Tariff: Item	Number	Normal Trade Relations 12/31/03
Unwrought indium, including powder	8112.92.3000	Free.

Depletion Allowance: 14% (Domestic and foreign).

Government Stockpile: None.

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INDIUM

Events, Trends, and Issues: Estimated domestic indium consumption increased by about 6% to 90 tons in 2003. After the annual average price of indium dropped in 2000 and 2001, it remained relatively stable in 2002 through the third quarter when it began to climb considerably. Although continued strong sales of flat panel displays and other LCD products increased demand for indium-tin oxide, the use of indium phosphide for semiconductors was negatively affected by the continued downturn in the world economy. The report of reduced production from mines that produce byproduct indium had a negative impact on the perceived availability of indium from China, which drove world prices up to the highest levels in 4 years. Although the short-range outlook for indium demand remains attractive, market supply remains questionable with its heavy dependence on the strength of the zinc market. Recycling efforts, especially in Japan, have done much to offset shortages in supply and to alleviate price pressures.

World Refinery Production, Reserves, and Reserve Base:

	Refinery production[e]		Reserves[3]	Reserve base[3]
	2002	2003		
United States	—	—	300	600
Belgium	40	40	([4])	([4])
Canada	45	50	700	2,000
China	85	100	280	1,300
France	65	10	([4])	([4])
Japan	60	55	100	150
Peru	5	5	100	150
Russia	15	15	200	300
Other countries	20	20	800	1,500
World total (rounded)	335	295	2,500	6,000

World Resources: Indium is a rare element and ranks 61st in abundance in the Earth's crust at an estimated 240 parts per billion by weight. This makes it about three times more abundant than silver or mercury.

Indium occurs predominantly in the zinc-sulfide ore mineral, sphalerite. The average indium content of zinc deposits from which it is recovered ranges from less than 1 part per million to 100 parts per million. Although the geochemical properties of indium are such that it also tends to occur with the base metals—copper, lead, and tin—and to a lesser extent with bismuth, cadmium, and silver, most of these deposits are subeconomic for indium.

Vein stockwork deposits of tin and tungsten host the highest known concentrations of indium. However, the indium from this type of deposit is usually difficult to process economically. Other major geologic hosts for indium mineralization include volcanic-hosted massive sulfide deposits, sediment-hosted exhalative massive sulfide deposits, polymetallic vein-type deposits, epithermal deposits, active magmatic systems, porphyry copper deposits, and skarn deposits.

Substitutes: Indium has substitutes in many, perhaps most, of its uses; however, the substitutes usually lead to losses in production efficiency or product characteristics. Silicon has largely replaced germanium and indium in transistors. Although more expensive, gallium can be used in some applications as a substitute for indium in several alloys. In glass-coating applications, silver-zinc oxides or tin oxides can be used. Although technically inferior, zinc-tin oxides can be used in LCDs. Indium phosphide can be substituted by gallium arsenide in solar cells and in many semiconductor applications. Hafnium can replace indium alloys for use in nuclear reactor control rods.

[e]Estimated. NA Not available. — Zero.
[1]Imports for consumption are based on U.S. Department of Commerce, U.S. Treasury, and U.S. International Trade Commission data for unwrought and waste and scrap (includes indium powder after 2002).
[2]Defined as imports – exports + adjustments for Government and industry stock changes; exports were assumed to be no greater than the difference between imports and consumption.
[3]Estimate based on the indium content of zinc ores. See Appendix C for definitions.
[4]Reserves and reserve base for this country and other European nations are included with "Other countries."