

## INDIUM

(Data in metric tons, unless otherwise noted)

**Domestic Production and Use:** No indium was recovered from ores in the United States in 1997. Domestically produced indium was derived from the upgrading of lower grade imported indium metal. Two companies, one each in New York and Rhode Island, were the major producers of indium metal and indium products in 1997. Several firms produced high-purity indium shapes, alloys, and compounds. Thin-film coatings, which are used in applications such as liquid crystal displays and electroluminescent lamps, 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 1997 was about the same as in 1996: coatings, 45%; solders and alloys, 35%; electrical components and semiconductors, 15%; and research and other, 5%. The estimated value of primary metal consumed in 1997, based on the annual average price, was \$15.4 million.

<b>Salient Statistics—United States:</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997<sup>e</sup></b>
Production, refinery	—	—	—	—	—
Imports for consumption	73.4	70.2	85.2	33.2	80
Exports	NA	NA	NA	NA	NA
Consumption <sup>e</sup>	35.0	40.0	43.0	45.0	50
Price, annual average, dollars per kilogram (99.97% indium)	200	138	375	370	309
Stocks, producer, yearend	NA	NA	NA	NA	NA
Employment, number	NA	NA	NA	NA	NA
Net import reliance <sup>1</sup> as a percent of apparent consumption	NA	NA	NA	NA	NA

**Recycling:** Small quantities of old scrap were recycled. Recycling of new scrap, the scrap from fabrication of indium products, has become significant.

**Import Sources (1993-96):** Canada, 40%; Russia, 13%; France, 10%; Italy, 8%; and other, 29%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Most favored nation (MFN) 12/31/97</b>	<b>Non-MFN<sup>2</sup> 12/31/97</b>
Unwrought, waste and scrap	8112.91.3000	Free	25% ad. val.

**Depletion Allowance:** 14% (Domestic), 14% (Foreign).

### **Government Stockpile:**

<b>Material</b>	<b>Stockpile Status—9-30-97<sup>3</sup></b>				
	<b>Uncommitted inventory</b>	<b>Committed inventory</b>	<b>Authorized for disposal</b>	<b>Disposal plan FY 1997</b>	<b>Disposals FY 1997</b>
Indium	0.44	—	—	1.09	1.12

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**Events, Trends, and Issues:** Estimated domestic indium consumption increased to about 50 tons in 1997. The indium market appeared to be more stable in 1997 than it was in 1995 and 1996. In 1995, prices rose steadily over concerns about supply, while demand remained strong. In 1996, significant quantities of indium were recycled, the result of high prices and large supplies of indium-tin-oxide manufacturing scrap and spent sputtering targets. This brought about a steady decrease in prices and significantly lower U.S. imports. In 1997, there were at least three major fluctuations in price, in which the market activities of Japan as a buyer, and China as a seller were significant factors. The domestic price started the year at \$210 per kilogram, rose to about \$325 per kilogram by May, then fell to \$285 per kilogram by July. The price finally rose to \$303 per kilogram in mid-September, at which level it remained through the rest of the year. The long range outlook for the indium market remains promising.

### **World Refinery Production, Reserves, and Reserve Base:**

	Refinery production <sup>e</sup>		Reserves <sup>4</sup>	Reserve base <sup>4</sup>
	1996	1997		
United States	—	—	300	600
Belgium	15	12	( <sup>5</sup> )	( <sup>5</sup> )
Canada	15	50	700	2,000
China	45	45	400	1,000
France	45	45	( <sup>5</sup> )	( <sup>5</sup> )
Italy	12	12	( <sup>5</sup> )	( <sup>5</sup> )
Japan	40	40	100	150
Peru	4	4	100	150
Russia	20	20	200	300
Other countries	<u>4</u>	<u>4</u>	<u>800</u>	<u>1,500</u>
World total (may be rounded)	200	230	2,600	5,700

**World Resources:** Indium occurs predominantly in solid solution in sphalerite, a sulfide ore of zinc. Significant quantities of indium also are contained in ores of copper, lead, and tin, but there is not enough information to formulate reliable estimates of indium resources, and most of these deposits are subeconomic for indium anyway. Indium is recovered almost exclusively as a byproduct of zinc. Estimates of the average indium content of the Earth's crust range from 50 to 200 parts per billion. The average indium content of zinc deposits ranges from less than 1 part per million to 100 parts per million. The highest known concentrations of indium occur in vein or replacement sulfide deposits, usually associated with tin-bearing minerals. However, this type of deposit is usually difficult to process economically.

**Substitutes:** Gallium arsenide can substitute for indium phosphide in solar cells and semiconductor applications. Silver-zinc oxide or tin oxide are lower cost substitutes for indium-tin oxide in transparent conductive coatings for glass. Hafnium can replace indium alloys for use in nuclear reactor control rods.

<sup>e</sup>Estimated. NA Not available.

<sup>1</sup>Defined as imports - exports + adjustments for Government and industry stock changes.

<sup>2</sup>See Appendix B.

<sup>3</sup>See Appendix C for definitions

<sup>4</sup>Estimate based on the indium content of zinc ores. See Appendix D for definitions.

<sup>5</sup>Reserves for European countries are included in "Other countries."