

INDIUM

(Data in metric tons unless otherwise noted)

Domestic Production and Use: Indium was not recovered from ores in the United States in 2013. Two companies, one in New York and the other in Rhode Island, produced high-purity indium metal and indium products from lower grade imported indium metal. Several additional firms produced high-purity indium shapes, alloys, indium tin oxide (ITO), and other indium compounds from imported indium. Production of ITO continued to account for most of global indium consumption. ITO thin-film coatings were primarily used for electrical conductive purposes in a variety of flat-panel displays—most commonly liquid crystal displays (LCDs). Other indium end uses included solders and alloys, compounds, electrical components and semiconductors, and research. The estimated value of primary indium metal consumed domestically in 2013, based on the annual average New York dealer price, was about \$62 million.

Salient Statistics—United States:	2009	2010	2011	2012	2013^e
Production, refinery	—	—	—	—	—
Imports for consumption ¹	105	117	146	109	90
Exports	NA	NA	NA	NA	NA
Consumption, estimated	100	100	100	100	100
Price, annual average, dollars per kilogram:					
U.S. producer ²	500	565	720	650	620
New York dealer ³	382	552	685	540	570
99.99% c.i.f. Japan ⁴	348	546	680	510	580
Net import reliance ⁵ as a percentage of estimated consumption	100	100	100	100	100

Recycling: Data on the quantity of secondary indium recovered from scrap were not available. Indium is most commonly recovered from ITO scrap in Japan and the Republic of Korea.

Import Sources (2009–12):¹ Canada, 24%; China, 23%; Japan, 13%; Belgium, 11%; and other, 29%.

Tariff:	Item	Number	Normal Trade Relations
	Unwrought indium, including powders	8112.92.3000	<u>12–31–13</u> Free.

Depletion Allowance: 14% (Domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Although U.S. producer and dealer prices on average were significantly higher than the price in Japan during 2012, the average prices all converged during 2013. The estimated annual average New York dealer price of indium was \$570 per kilogram, 6% more than that of 2012. The New York dealer price range for indium began the year at \$485 to \$500 per kilogram and generally increased through the year, averaging \$560 to \$585 per kilogram in the third quarter. In early November, the price ranged from \$690 to \$715 per kilogram. The U.S. producer price for indium began the year at \$580 per kilogram and increased to \$680 per kilogram in August, where it remained through November.

Imports of indium into Japan and the Republic of Korea, the two leading consumers of indium, increased during the first 8 months of 2013 compared with imports during the same period of 2012. Reports indicated that demand for ITO increased during the year from that in 2012 owing to a rise in demand for flat-panel displays in developing countries, especially in China. In addition to increasing demand for ITO in LCD displays, two leading flat-panel makers announced intentions to replace amorphous silicon with indium-gallium-zinc-oxide (IGZO) as the thin-film transistor in displays used in some consumer electronics, including organic light-emitting diode (OLED) televisions, smartphones, and tablets.

During the first 8 months of 2013, China imported 97 tons of unwrought and wrought indium, more than five times the amount imported during the corresponding period of 2012. Although indium consumption in China was reported to have remained unchanged in 2013, net imports rose owing to increased investment demand. Inventories of indium at the Fanya Nonferrous Metals Exchange at the end of September were 1,565 tons, an increase of 955 tons from those at the end of January.

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World Refinery Production and Reserves: Estimated refinery production data for China and the Republic of Korea were revised owing to new country and company information.

	Refinery production		Reserves ⁶
	<u>2012</u>	<u>2013^e</u>	
United States	—	—	Quantitative estimates of reserves are not available.
Belgium	30	30	
Canada	62	65	
China	405	410	
Japan	71	71	
Korea, Republic of	165	150	
Peru	11	10	
Russia	13	13	
Other countries	<u>25</u>	<u>25</u>	
World total (rounded)	<u>782</u>	<u>770</u>	

World Resources: Indium is most commonly recovered from 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 occurs in trace amounts in other base-metal sulfides—particularly chalcopyrite and stannite—most deposits of these metals are subeconomic for indium.

Substitutes: Indium's recent price volatility and various supply concerns associated with the metal have spurred the development of ITO substitutes. Antimony tin oxide coatings have been developed as an alternative to ITO coatings in LCDs and have been successfully annealed to LCD glass. Carbon nanotube coatings have been developed as an alternative to ITO coatings in flexible displays, solar cells, and touch screens. Poly(3,4-ethylene dioxythiophene) (PEDOT) has also been developed as a substitute for ITO in flexible displays and organic light-emitting diodes. Graphene quantum dots have been developed to replace ITO electrodes in solar cells and also have been explored as a replacement for ITO in LCDs. Researchers have recently developed a more adhesive zinc oxide nanopowder to replace ITO in LCDs. Gallium arsenide can substitute for indium phosphide in solar cells and in many semiconductor applications. Hafnium can replace indium in nuclear reactor control rod alloys.

^eEstimated. NA Not available. — Zero.

¹Imports for consumption of unwrought indium and indium powders (Tariff no. 8112.92.3000).

²Indium Corp.'s price for 99.97%-purity metal; 1-kilogram bar in lots of 10,000 troy ounces. Source: Metal Bulletin, Platts Metals Week.

³Price is based on 99.99%-minimum-purity indium at warehouse (Rotterdam); cost, insurance, and freight (in minimum lots of 50 kilograms). Source: Platts Metals Week.

⁴Price is based on 99.99%-purity indium, primary or secondary, shipped to Japan. Source: Platts Metals Week.

⁵Defined as imports – exports.

⁶[See Appendix C for resource/reserve definitions and information concerning data sources.](#)