

INDIUM

(Data in metric tons unless otherwise noted)

Domestic Production and Use: Indium was not recovered from ores in the United States in 2018. Several companies produced indium products—including alloys, compounds, high-purity metal, and solders—from imported indium metal. Production of indium tin oxide (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 alloys and solders, compounds, electrical components and semiconductors, and research. Based on an average of recent annual import levels, estimated domestic consumption of refined indium was 170 tons in 2018. The estimated value of refined indium consumed domestically in 2018, based on the average New York dealer price, was about \$53 million.

<u>Salient Statistics—United States:</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018^e</u>
Production, refinery	—	—	—	—	—
Imports for consumption	123	140	160	127	170
Exports	NA	NA	NA	NA	NA
Consumption, estimated ¹	123	140	160	127	170
Price, annual average, dollars per kilogram:					
New York dealer ²	705	520	345	363	380
Free market ³	NA	410	240	225	310
Net import reliance ⁴ as a percentage of estimated consumption	100	100	100	100	100

Recycling: Indium is most commonly recovered from ITO scrap in Japan and the Republic of Korea. A significant quantity of scrap was recycled domestically; however, data on the quantity of secondary indium recovered from scrap were not available.

Import Sources (2014–17): China, 27%; Canada, 22%; Republic of Korea, 11%; Taiwan, 10%; and other, 30%.

<u>Tariff:</u> Item	Number	Normal Trade Relations
Unwrought indium, including powders	8112.92.3000	<u>12–31–18</u> Free.

Depletion Allowance: 14% (Domestic and foreign).

Government Stockpile: None.

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Events, Trends, and Issues: The 2018 estimated average New York dealer price of indium was \$380 per kilogram, 5% more than in 2017. The average monthly price began the year at \$350 per kilogram in January and increased to a monthly average of \$390 per kilogram in May, where it remained through October. The 2018 estimated average free market price of indium was \$310 dollars per kilogram, 38% more than in 2017. The average monthly free market price began the year at \$284 per kilogram, increased to an average of \$349 per kilogram in April, and decreased through the year to an average of \$258 per kilogram in September.

In May 2018, the U.S. Department of the Interior, in coordination with other executive branch agencies, published a list of 35 critical minerals (83 FR 23295), including indium. This list was developed to serve as an initial focus, pursuant to Executive Order 13817, “A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals” (82 FR 60835).

World Refinery Production and Reserves:

	Refinery production		Reserves ⁵
	<u>2017</u>	<u>2018^e</u>	
United States	—	—	Quantitative estimates of reserves are not available.
Belgium	20	20	
Canada	67	70	
China	287	300	
France	30	50	
Japan	70	70	
Korea, Republic of	225	230	
Peru	10	10	
Russia	<u>5</u>	<u>5</u>	
World total (rounded)	714	750	

World Resources: Indium is most commonly recovered from the zinc-sulfide ore mineral sphalerite. The 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 minerals are subeconomic for indium.

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; PEDOT [poly(3,4-ethylene dioxythiophene)] has also been developed as a substitute for ITO in flexible displays and organic light-emitting diodes; and copper or silver nanowires have been explored as a substitute for ITO in touch screens. Graphene has been developed to replace ITO electrodes in solar cells and also has been explored as a replacement for ITO in flexible touch screens. Researchers have developed a more adhesive zinc oxide nanopowder to replace ITO in LCDs. Hafnium can replace indium in nuclear reactor control rod alloys.

^eEstimated. NA Not available. — Zero.

¹Estimated to equal imports.

²Price is based on 99.99%-minimum-purity indium; delivered duty paid U.S. buyers; in minimum lots of 50 kilograms. Source: Platts Metals Week.

³Price is based on 99.99%-minimum-purity indium at warehouse (Rotterdam). Source: Metal Bulletin.

⁴Defined as imports – exports.

⁵See Appendix C for resource and reserve definitions and information concerning data sources.