

INDIUM

(Data in metric tons unless otherwise noted)

Domestic Production and Use: Indium was not recovered from ores in the United States in 2019. 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 110 tons in 2019. The estimated value of refined indium consumed domestically in 2019, based on the average New York dealer price, was about \$43 million.

<u>Salient Statistics—United States:</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019^e</u>
Production, refinery	—	—	—	—	—
Imports for consumption	140	160	127	125	110
Exports	NA	NA	NA	NA	NA
Consumption, estimated ¹	140	160	127	125	110
Price, annual average, dollars per kilogram:					
New York dealer ²	520	345	363	375	390
Duties unpaid in warehouse, Rotterdam ³	410	240	225	291	210
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 (2015–18): China, 36%; Canada, 22%; Republic of Korea, 11%; Taiwan, 7%; and other, 24%.

<u>Tariff:</u> Item	<u>Number</u>	<u>Normal Trade Relations</u> <u>12–31–19</u>
Unwrought indium, including powders, waste, and scrap	8112.92.3000	Free.

Depletion Allowance: 14% (Domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: The 2019 estimated average New York dealer price of indium was \$390 per kilogram, 4% more than that of 2018. The average monthly price in January was \$390 per kilogram where it remained through September. The 2019 estimated average free market price of indium was \$210 per kilogram, 28% less than in 2018. The average monthly free market price began the year at \$232 per kilogram and decreased throughout the year to an average of \$160 per kilogram in September.

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In January, the Fanya Metal Exchange attempted to auction two lots of indium, totaling 37.41 tons, with a starting price of \$170 per kilogram, but no bids were received. A second auction for 34.64 tons of indium was held in April, and the total lot sold for about \$5.5 million (\$161 per kilogram) to the State-owned China National Corporation for Overseas Economic Cooperation (CCOEC). The Fanya Metal Exchange reportedly held 3,600 tons of indium, which is equivalent to 4 years of global primary indium production, before it closed in 2015.

New telecommunication networks have created a new demand for indium, which is used for indium phosphide (InP) lasers and receivers. InP lasers are used in telecommunications for fiber-optic networks that have connections between third-, fourth-, and fifth-generation (3G, 4G, and 5G) wireless antennas; have data transmission speeds of greater than 10 terabits per second; and have total transmission distances of more than 5,000 kilometers.

World Refinery Production and Reserves:

	Refinery production		Reserves⁵
	<u>2018</u>	<u>2019^e</u>	
United States	—	—	Quantitative estimates of reserves are not available.
Belgium	22	20	
Canada	58	60	
China	300	300	
France	40	50	
Japan	70	75	
Korea, Republic of	235	240	
Peru	11	10	
Russia	<u>5</u>	<u>5</u>	
World total (rounded)	741	760	

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, duties unpaid in warehouse (Rotterdam). Sources: Metal Bulletin (2015–2017) and Argus Media group–Argus Metals International (2018–2019).

⁴Defined as imports – exports.

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