INDIUM

(Data in metric tons unless otherwise specified)

Domestic Production and Use: Indium was not recovered from ores in the United States in 2023. 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 global indium consumption. ITO thin-film coatings were primarily used for electrically 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. Estimated domestic consumption of refined indium was 300 tons in 2023 and was based on the annual estimated import quantity. There were no readily available recycling or end-use data available for indium. The estimated value of refined indium consumed domestically in 2023, based on the average U.S. warehouse price, was about $72 million.

Salient Statistics—United States:	2019	2020	2021	2022	2023[e]
Production, refinery	—	—	—	—	—
Imports for consumption	95	115	158	202	300
Exports	NA	NA	NA	NA	NA
Consumption, estimated[1]	95	115	158	202	300
Price, annual average, dollars per kilogram:					
New York dealer[2]	390	395	NA	NA	NA
U.S. warehouse, free on board[3]	182	161	223	250	240
Rotterdam, duties unpaid[4]	177	158	217	252	240
Net import reliance[5] 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. Indium-containing scrap was recycled domestically; however, data on the quantity of indium recovered from scrap were not available.

Import Sources (2019–22): Republic of Korea, 32%; Canada, 19%; Belgium, 11%; and other, 38%.

Tariff: Item	Number	Normal Trade Relations 12–31–23
Unwrought indium, including powders	8112.92.3000	Free.

Depletion Allowance: 14% (domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: In 2023, the estimated annual average U.S. warehouse price (free on board) was $240 per kilogram, 4% less than the reported average price in 2022. The U.S. price, as reported by Argus Media Group, Argus Non-Ferrous Markets, began the year at $223 per kilogram and remained around $220 through midyear. By the end of September, tight feedstock availability caused prices to trend upward to $275.

In February, an Australian company completed the maiden resource estimate on its zinc-copper-silver-indium project in Utah. The resource estimate did not include indium owing to data gaps in historical drilling, but the company began a resampling program to include indium in the next resource update. The historical resource estimate, completed in 2014, included about 1,530 tons of contained indium.

A manufacturer of navigation and inertial sensing products announced that it would begin a restructuring program that would shut down its broadband business segment. The restructuring program would include closing down its indium phosphide (InP) wafer fabrication facility, located in Alhambra, CA.

In Bolivia, the Minister of Mining and Metallurgy announced that it was finalizing a $350 million loan from the Export-Import Bank of China to aid in the construction of a zinc refinery, also capable of processing indium. The refinery would be built in the city of Oruro. Bolivia has large indium deposits and has been exporting zinc ores to Europe for indium recovery.

An indium-producing zinc smelter in Auby, France, was placed on care-and-maintenance status in December 2022 owing to unfavorable market conditions. The company announced that it would use this period to apply planned investments to improve operations. The facility was reopened in March 2023, but with variable production.

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INDIUM

China, the leading producer and exporter of indium globally, exported 381 tons of indium in the first 8 months of 2023 according to international trade statistics. This was a 9% decrease compared with exports in the same period in 2022. Exports were primarily sent to the Republic of Korea, 57%; Hong Kong, 25%; and Singapore, 11%.

The advent of fifth-generation (5G) technologies continued to increase demand for indium. InP-based substrates are used in 5G fiber-optic telecommunications networks where InP lasers and receivers send data through fiber-optic lines, which allow for lower latency, reduced signal loss, and faster speeds.

The growing interest in artificial intelligence (AI) is expected to increase demand for specialized chip materials that allow for more advanced computation. One U.S.-based chipmaker announced in May that demand from data centers for AI chips was largely responsible for its second quarter revenue, which was 54% higher than expected. According to the consulting firm McKinsey, around two-thirds of the AI hardware demand will come from data centers for use in servers. Indium, as ITO, is used as a coating on data center fibers and cables to increase signal transmission and reduce loss. As InP, indium is used in high-speed photodetectors and laser diodes for optical communications. Additionally, some electrical components in data centers use indium-based solder alloys.

World Refinery Production and Reserves:

	Refinery production[e, 6]		Reserves[7]
	2022	2023	
United States	—	—	Quantitative estimates of reserves were not available.
Belgium	19	18	
Canada	39	37	
China	670	650	
France	19	12	
Japan	66	64	
Korea, Republic of	180	200	
Russia	5	5	
Uzbekistan	1	1	
World total (rounded)	999	990	

World Resources:[7] 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—indium recovery from most deposits of these minerals was not economic.

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; 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.

[e]Estimated. NA Not available. — Zero.

[1]Estimated to equal imports.

[2]Price is based on 99.99%-minimum-purity indium, delivered duty paid by U.S. buyers, in minimum lots of 50 kilograms. Source: S&P Global Platts Metals Week; price was discontinued as of September 11, 2020.

[3]Price is based on 99.99%-minimum-purity indium, free on board U.S. warehouse. Source: Argus Media Group, Argus Non-Ferrous Markets.

[4]Price is based on 99.99%-minimum-purity indium, duties unpaid in warehouse (Rotterdam). Source: Argus Media Group, Argus Non-Ferrous Markets.

[5]Defined as imports – exports.

[6]Refinery production data for indium were limited or unavailable for most countries. Estimates were derived from trade data, production capacity, and (or) changes in related lead and zinc smelter production.

[7]See Appendix C for resource and reserve definitions and information concerning data sources.