

## IODINE

(Data in metric tons, elemental iodine, unless otherwise specified)

**Domestic Production and Use:** Iodine was produced from brines in 2023 by three companies operating in Oklahoma. U.S. iodine production in 2023 was withheld to avoid disclosing company proprietary data but was estimated to have decreased from that in 2022. The annual average cost, insurance, and freight unit value of iodine imports in 2023 was estimated to be \$61 per kilogram, about 30% more than that in 2022.

Because domestic and imported iodine was used by downstream manufacturers to produce many intermediate iodine compounds, it was difficult to establish an accurate end-use pattern. Crude iodine and inorganic iodine compounds were thought to account for more than 50% of domestic iodine consumption in 2023. Worldwide, the leading uses of iodine and its compounds were X-ray contrast media (XRCM), pharmaceuticals, liquid crystal displays (LCDs), iodophors, animal feed, and fluorochemicals, in descending order of quantity consumed. Other applications of iodine included biocides, food supplements, and nylon.

**Salient Statistics—United States:**

	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023<sup>e</sup></u>
Production	W	W	W	W	W
Imports for consumption	4,300	4,570	4,120	4,270	3,600
Exports	1,230	1,130	1,280	1,140	1,300
Consumption:					
Apparent <sup>1</sup>	W	W	W	W	W
Reported	4,000	3,750	3,720	3,330	3,000
Price, crude iodine, average unit value of imports (cost, insurance, and freight), dollars per kilogram	26.38	31.57	32.72	45.81	61
Employment, number <sup>e</sup>	60	60	60	60	60
Net import reliance <sup>2</sup> as a percentage of apparent consumption	>50	>50	>50	>50	>50

**Recycling:** Small amounts of iodine were recycled.

**Import Sources (2019–22):** Chile, 89%; Japan, 10%; and other, 1%.

<u>Tariff:</u>	<u>Item</u>	<u>Number</u>	<u>Normal Trade Relations</u>
	Iodine, crude	2801.20.0000	<u>12–31–23</u> Free.

**Depletion Allowance:** 14% (domestic and foreign).

**Government Stockpile:** None.

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**Events, Trends, and Issues:** According to industry publications, spot prices for iodine crystal averaged about \$73 per kilogram during the first 8 months of 2023. This was about 5% more than the 2022 annual average of \$69.11 per kilogram. Iodine price increases were attributed to strong global demand and limited supply.

One U.S. producer opened a sixth iodine production plant in mid-2023. The new plant was expected to add an additional 100 to 150 metric tons per year of crystalline iodine to the company's annual production.

As in recent years, Chile was the world's leading producer of iodine, followed by Japan and the United States. Excluding production in the United States, Chile accounted for about two-thirds of world production in 2023. Most of the world's iodine supply comes from three areas: the Chilean desert nitrate mines, the gasfields and oilfields in Japan, and the iodine-rich brine wells in northwestern Oklahoma.

**World Mine Production and Reserves:** Reserves data for Iran were revised based on Government reports. China also produces crude iodine, but output was not officially reported, and available information was inadequate to make reliable estimates of output. Available information was inadequate to make an estimate of iodine reserves in Indonesia for 2022.

	Mine production <sup>e</sup>		Reserves <sup>3</sup>
	<u>2022</u>	<u>2023</u>	
United States	W	W	250,000
Azerbaijan	170	200	170,000
Chile	19,200	19,000	610,000
Indonesia	<sup>4</sup> 29	30	NA
Iran	700	700	40,000
Japan	9,200	9,000	4,900,000
Russia	3	3	120,000
Turkmenistan	<u>770</u>	<u>800</u>	<u>70,000</u>
World total (rounded)	<sup>5</sup> 30,100	<sup>5</sup> 30,000	<u>6,200,000</u>

**World Resources:**<sup>3</sup> Seawater contains 0.06 part per million iodine, and the oceans are estimated to contain approximately 90 billion tons of iodine. Seaweeds of the Laminaria family are able to extract and accumulate up to 0.45% iodine on a dry basis. Although not as economical as the production of iodine as a byproduct of gas, nitrates, and oil, the seaweed industry represented a major source of iodine prior to 1959 and remains a large resource.

**Substitutes:** No comparable substitutes exist for iodine in many of its principal applications, such as in animal feed, catalytic, nutritional, pharmaceutical, and photographic uses. Bromine and chlorine could be substituted for iodine in biocide, colorant, and ink, although they are usually considered less desirable than iodine. Antibiotics can be used as a substitute for iodine biocides.

<sup>e</sup>Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data.

<sup>1</sup>Defined as production + imports – exports.

<sup>2</sup>Defined as imports – exports.

<sup>3</sup>See Appendix C for resource and reserve definitions and information concerning data sources.

<sup>4</sup>Reported.

<sup>5</sup>Excludes U.S. production.