TELLURIUM

(Data in metric tons unless otherwise noted)

Domestic Production and Use: In 2019, no tellurium was produced in the United States. One firm in Texas was thought to export copper anode slimes to Mexico for recovery of commercial-grade tellurium. Downstream companies further refined imported commercial-grade metal to produce tellurium dioxide, high-purity tellurium, and tellurium compounds for specialty applications.

Tellurium was predominantly used in the production of cadmium telluride (CdTe) for thin-film solar cells. Another important end use was for the production of bismuth telluride (BiTe), which is used in thermoelectric devices for both cooling and energy generation. Other uses were as an alloying additive in steel to improve machining characteristics, as a minor additive in copper alloys to improve machinability without reducing conductivity, in lead alloys to improve resistance to vibration and fatigue, in cast iron to help control the depth of chill, and in malleable iron as a carbide stabilizer. It was used in the chemical industry as a vulcanizing agent and accelerator in the processing of rubber and as a component of catalysts for synthetic fiber production. Other uses included those in photoreceptor and thermoelectric devices, blasting caps, and as a pigment to produce various colors in glass and ceramics.

Global consumption estimates of tellurium by end use are solar, 40%; thermoelectric production, 30%; metallurgy, 15%; rubber applications, 5%; and other, 10%.

Salient Statistics—United States:	2015	2016	2017	2018	2019[e]
Production, refinery	—	—	—	—	—
Imports for consumption	76	73	163	192	50
Exports	41	3	2	4	1
Consumption, apparent[1]	W	W	W	W	W
Price, dollars per kilogram[2]	79	36	38	80	70
Stocks, producer, refined, yearend	W	W	W	W	W
Net import reliance[3] as a percentage of apparent consumption	>95	>95	>95	>95	>95

Recycling: For traditional metallurgical and chemical uses, there was little or no old scrap from which to extract secondary tellurium because these uses of tellurium are highly dispersive or dissipative. A very small amount of tellurium was recovered from scrapped selenium-tellurium photoreceptors employed in older plain-paper copiers in Europe. A plant in the United States recycled tellurium from CdTe solar cells; however, the amount recycled was limited because most CdTe solar cells were relatively new and had not reached the end of their useful life.

Import Sources (2015–18): Canada, 64%; China, 25%; Germany, 7%; and other, 4%.

Tariff: Item	Number	Normal Trade Relations 12–31–19
Tellurium	2804.50.0020	Free.

Depletion Allowance: 14% (Domestic and foreign).

Government Stockpile: None.

Events, Trends, and Issues: Domestic tellurium production was estimated to have remained essentially unchanged from that in 2018. One domestic producer of anode slimes shipped at least a portion of its anode slimes to Mexico for treatment and refining. World production of tellurium in 2019 was estimated to be about 470 tons. In 2019, the domestic average monthly price of tellurium generally decreased in the first 10 months of the year, from around $80 per kilogram in January to $65 per kilogram in October.

Prepared by **C. Schuyler Anderson [(703) 648–4985, csanderson@usgs.gov]**

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Domestic imports of tellurium were estimated to have decreased by about 74% in 2019 from those of 2018, mostly as a result of a significant decrease in imports from China and Canada. During the first 8 months of 2019, the United States imported 2 tons of tellurium from Canada and 0.3 tons of tellurium from China. During the same period of 2018, the United States imported 99 tons of tellurium from Canada and 7 tons of tellurium from China.

China was the leading producer of refined tellurium, recovering tellurium from copper anode slimes and from residues generated during the lead, nickel, precious metals, and zinc smelting processes.

The Yunnan Provincial government in China announced an auction of 170 tons of tellurium from the defunct Fanya Metal Exchange (FME) with a starting price of $43 per kilogram (306 yuan per kilogram), or a total lot bid of $7.34 million (51.95 million yuan).

A solar cell manufacturer in Germany announced in April that it would increase production rate of CdTe solar cells to 60 megawatts per year after finding a new investor in July 2018.

World Refinery Production and Reserves: The figures shown for reserves include only tellurium contained in copper reserves. These estimates assume that more than one-half of the tellurium contained in unrefined copper anodes is recoverable.

	Refinery production[e]		Reserves[4]
	2018	2019	
United States	—	—	3,500
Bulgaria	5	5	NA
Canada	25	30	800
China	280	290	6,600
Japan	58	55	—
Russia	42	40	NA
South Africa	6	5	—
Sweden	45	40	670
Other countries[5]	NA	NA	19,000
World total (rounded)	460	470	31,000

World Resources: Data on tellurium resources were not available. More than 90% of tellurium has been produced from anode slimes collected from electrolytic copper refining, and the remainder was derived from skimmings at lead refineries and from flue dusts and gases generated during the smelting of bismuth, copper, and lead-zinc ores. Potential sources of tellurium include bismuth telluride and gold telluride ores.

Substitutes: Several materials can replace tellurium in most of its uses, but usually with losses in efficiency or product characteristics. Bismuth, calcium, lead, phosphorus, selenium, and sulfur can be used in place of tellurium in many free-machining steels. Several of the chemical process reactions catalyzed by tellurium can be carried out with other catalysts or by means of noncatalyzed processes. In rubber compounding, sulfur and (or) selenium can act as vulcanization agents in place of tellurium. The selenides and sulfides of niobium and tantalum can serve as electrical-conducting solid lubricants in place of tellurides of those metals.

The selenium-tellurium photoreceptors used in some plain paper photocopiers and laser printers have been replaced by organic photoreceptors in newer devices. Amorphous silicon and copper indium gallium selenide were the two principal competitors of CdTe in thin-film photovoltaic solar cells. Bismuth selenide and organic polymers can be used to substitute for some BiTe thermal devices.

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.

[1]Defined as production + imports – exports + adjustments for industry stock changes.

[2]Average annual price. Source: Argus Media group–Argus Metals International for 99.95% tellurium, free on board, U.S. warehouses.

[3]Defined as imports – exports + adjustments for industry stock changes.

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

[5]In addition to the countries listed, Australia, Belgium, Chile, Colombia, Germany, Kazakhstan, Mexico, the Philippines, and Poland produced refined tellurium, but output was not reported and available information was inadequate to make reliable production and reserves estimates.