TELLURIUM

(Data in metric tons of tellurium content, unless otherwise noted)

Domestic Production and Use: In the United States, one firm produced commercial-grade tellurium at its refinery complex, mainly from copper anode slimes but also from lead refinery skimmings. Primary and intermediate producers further refined commercial-grade metal and tellurium dioxide, producing tellurium and tellurium compounds in high-purity form for specialty applications.

Tellurium's major use is as an alloying additive in steel to improve machining characteristics. It is also used as a minor additive in copper, to improve machinability without reducing conductivity; in lead, 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 is also 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. Tellurium's other uses include those in photoreceptor and thermoelectric devices for electronic applications, as an ingredient in blasting caps, and as a pigment to produce various colors in glass and ceramics.

In 2003, the estimated distribution of uses, worldwide, was as follows: iron and steel products, 50%; catalysts and chemicals, 25%; additives to nonferrous alloys, 10%; photoreceptors and thermoelectric devices, 8%; and other, 7%.

Salient Statistics—United States:	1999	2000	2001	2002	2003[e]
Production, refinery	W	W	W	W	W
Imports for consumption, unwrought, waste and scrap[1]	38	52	28	28	43
Exports[1]	NA	NA	NA	NA	NA
Consumption, apparent	NA	NA	NA	NA	NA
Price, dollars per pound, 99.7% minimum[2]	15	14	15	16	17
Stocks, producer, refined, yearend	W	W	W	W	W
Employment, number	NA	NA	NA	NA	NA
Net import reliance[3] as a percentage of apparent consumption	NA	NA	NA	NA	NA

Recycling: There is little or no scrap from which to extract secondary tellurium because the uses of tellurium are nearly all dissipative in nature. None is recovered currently in the United States, but a small amount may be recovered in Europe or elsewhere from scrapped selenium-tellurium photoreceptors employed in plain paper copiers.

Import Sources (1999-2002): Philippines, 39%; United Kingdom, 17%; Belgium, 15%; Canada, 13%; and other, 16%.

Tariff: Item	Number	Normal Trade Relations 12/31/03
Metal	2804.50.0020	Free.

Depletion Allowance: 14% (Domestic and foreign).

Government Stockpile: None.

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Events, Trends, and Issues: Domestic tellurium production was estimated to have decreased in 2003, compared with that of 2002. Domestic tellurium demand remained constant in 2003, while world tellurium demand increased slightly over the same period. World production of tellurium, a byproduct of copper refining, was up slightly, despite a marginal decrease in copper production, owing to its coproduct status with selenium. Selenium, which was in strong demand, experienced a surge in production from waste and anode slimes that contained coproduct tellurium. Detailed information on the world tellurium market was not available.

Tellurium supply and demand has remained in fairly close balance for the past decade. In the short term, significant increases are not anticipated in either consumption or production, although reductions in copper production may reduce tellurium supply. An increase in demand for high-purity tellurium for cadmium telluride solar cells might have a major impact on tellurium consumption. Tellurium consumption is increasing in thermal elements for small ice packs and refrigerators.

Tellurium alloyed with germanium and antimony used in digital video discs (DVD) consumes only small amounts of tellurium and will, therefore, have minimal impact on tellurium demand.

World Refinery Production, Reserves, and Reserve Base:

	Refinery production		Reserves[4]	Reserve base[4]
	2002	2003[e]		
United States	W	W	3,000	6,000
Canada	45	50	650	1,500
Japan	29	30	—	—
Peru	20	20	1,600	2,800
Other countries[5]	NA	NA	16,000	37,000
World total (rounded)	[6]94	[6]100	21,000	47,000

World Resources: The figures shown for reserves and reserve base include only tellurium contained in economic copper deposits. These estimates assume that less than one-half of the tellurium in the unrefined (blister) copper anodes is actually recovered.

More than 90% of tellurium is produced from anode muds collected from electrolytic copper refining, and the remainder, if any, is derived from skimmings at lead refineries and from flue dusts and gases generated during the smelting of bismuth, copper, and lead ores. As tellurium is recovered only from the electrolysis of smelted copper, growth in the popularity of leaching-electrowinning processes has exerted downward pressure on tellurium supply.

Substitutes: Several substitutes can replace tellurium in many, perhaps most, of it uses, but usually with losses in production 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 of the refractory metals can function as high-temperature, high-vacuum lubricants in place of the tellurides. The selenides and sulfides of niobium and tantalum can serve as electrically conducting solid lubricants in place of the tellurides of those metals.

The selenium-tellurium photoreceptors used in some xerographic copiers and laser printers are being replaced in newer machines by organic photoreceptors. Amorphous silicon and copper indium diselenide are the two principal competitors to cadmium telluride in photovoltaic power cells.

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

[1]Imports and exports of boron and tellurium are grouped together under the Harmonized Tariff Schedule; however, imports of boron are considered to be small relative to tellurium, while exports of boron may represent a significant portion of the combined total.

[2]Yearend prices quoted by the sole producer for specialty product. Price quotes for nonspecialty products show a considerable discount.

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

[4]See Appendix C for definitions. Estimates include tellurium contained in copper resources only.

[5]In addition to the countries listed, Australia, Belgium, China, Germany, Kazakhstan, the Philippines, Russia, and the United Kingdom produce refined tellurium, but output is not reported and available information is inadequate for formulation of reliable production estimates.

[6]Excludes refinery production from the United States and "Other countries."