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 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 is 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 2004, 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:	2000	2001	2002	2003	2004[e]
Production, refinery	W	W	W	W	W
Imports for consumption, unwrought, waste and scrap	52	28	28	48	70
Exports	7	7	2	10	10
Consumption, apparent	W	W	W	W	W
Price, dollars per pound, 99.95% minimum[1]	5	7	7	10	12
Stocks, producer, refined, yearend	W	W	W	W	W
Employment, number	NA	NA	NA	NA	NA
Net import reliance[2] as a percentage of apparent consumption	W	W	W	W	W

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 (2000-03): Philippines, 31%; Belgium, 21%; Germany; 18%; United Kingdom, 13%; and other, 17%.

Tariff: Item	Number	Normal Trade Relations 12-31-04
Tellurium	2804.50.0020	Free.

Depletion Allowance: 14% (Domestic and foreign).

Government Stockpile: None.

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Events, Trends, and Issues: Estimated domestic tellurium production decreased in 2004 as compared with that of 2003, and the domestic consumption was estimated to have increased during the same period. World tellurium consumption was also estimated to have increased slightly in 2004. World production of tellurium, a byproduct of copper refining, increased owing to an increase in world copper production. Russian tellurium production reportedly was significantly higher than that of 2003. 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 United States. In the short term, significant increases are not anticipated in either consumption or production, although increases in copper production may increase 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 was increasing in thermal elements for small ice packs and refrigerators.

Tellurium alloyed with germanium and antimony used in digital video discs (DVDs) consumes only small amounts of tellurium and will, therefore, have minimal impact on tellurium demand. However, new developments in bismuth-coupling material, which consists of bismuth, germanium, and tellurium and enables DVDs to be rewritable at high and low recording speeds, could have an impact on world demand.

World Refinery Production, Reserves, and Reserve Base:

	Refinery production		Reserves[3]	Reserve base[3]
	2003	2004[e]		
United States	W	W	3,000	6,000
Canada	45	40	650	1,500
Japan	28	35	—	—
Peru	20	20	1,600	2,800
Other countries[4]	NA	NA	16,000	37,000
World total (rounded)	[5]93	[5]95	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 wide use 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]Average yearend price published by Mining Journal for United Kingdom lump and powder, 99.95% tellurium.

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

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

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

[5]Excludes refinery production from the United States.