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, both of domestic origin. Primary and intermediate producers further refined domestic and imported 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 electronic devices, as an ingredient in blasting caps, and as a pigment to produce various colors in glass and ceramics.

In 2005, the estimated distribution of uses, worldwide, was as follows: iron and steel products, 48%; catalysts and chemicals, 25%; photoreceptors and thermoelectric devices, 12%; additives to nonferrous alloys, 8%; and other, 7%.

Salient Statistics—United States:	2001	2002	2003	2004	2005[e]
Production, refinery	W	W	W	W	W
Imports for consumption, unwrought, waste and scrap	32	34	55	75	60
Exports	8	3	10	6	58
Consumption, apparent	W	W	W	W	W
Price, dollars per pound, 99.95% minimum[1]	7	7	10	13	96
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. Currently, none is recovered in the United States, but a small amount may be recovered in Europe or elsewhere from scrapped selenium-tellurium photoreceptors employed in older plain paper copiers.

Import Sources (2001-04): Germany, 24%; Belgium, 21%; Philippines, 18%; Canada, 15%; and other, 22%.

Tariff: Item	Number	Normal Trade Relations 12-31-05
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 2005 as compared with that of 2004 owing to a labor strike that began in July and continued at least until October at the one domestic producer. Domestic consumption, however, was estimated to have increased significantly during the same period. Though detailed information on the world tellurium market was not available, world tellurium consumption was estimated to have increased significantly in 2005. World production of tellurium, a byproduct of copper refining, was believed to have increased owing to an increase in world copper production. Russian tellurium production in 2005 reportedly was much higher than in 2004. Selenium, a coproduct which was in strong demand, experienced a surge in production from waste and anode slimes that contained tellurium. In 2005, the U.S. producer of tellurium announced that it had filed for bankruptcy protection. The future of American production is therefore uncertain.

Tellurium supply and demand has remained in fairly close balance for the past decade in the United States. In 2005, however, demand greatly outstripped supply. There was a significant increase in demand for high-purity tellurium for cadmium telluride solar cells. Tellurium consumption also increased in thermal elements for small ice packs and refrigerators. The large supply imbalance led to a large price jump starting in late 2004 and extending through 2005.

Currently, tellurium alloyed with germanium and antimony used in digital video discs (DVDs) consumes only small amounts of tellurium. New developments in coupling materials, however, which consist of bismuth, germanium, and tellurium and enable DVDs to be rewritable at high and low recording speeds, could have an impact on future world demand.

World Refinery Production, Reserves, and Reserve Base:

	Refinery production		Reserves[3]	Reserve base[3]
	2004	2005[e]		
United States	W	W	3,000	6,000
Canada	40	50	700	1,500
Japan	33	35	—	—
Peru	20	28	1,600	2,800
Other countries[4]	NA	NA	16,000	37,000
World total (rounded)	[5]93	[5]113	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 contained in unrefined copper anodes is actually recovered.

More than 90% of tellurium is produced from anode slims collected from electrolytic copper refining, and the remainder is derived from skimmings at lead refineries and from flue dusts and gases generated during the smelting of bismuth, copper, and lead ores. In copper production, tellurium is recovered only from the electrolytic refining of smelted copper. Growth in the global use of the leaching solvent extraction-electrowinning processes for copper extraction has limited the growth of tellurium supply.

Substitutes: Several materials can replace tellurium in 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 tellurides. The selenides and sulfides of niobium and tantalum can serve as electrically conducting solid lubricants in place of tellurides of those metals.

The selenium-tellurium photoreceptors used in some xerographic copiers and laser printers have been mostly being replaced by organic photoreceptors in newer machines. 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.