

# Tellurium

*Micheal W. George, the tellurium commodity specialist for the U.S. Geological Survey, has compiled the following information on tellurium, a rare and expensive metal used in semiconductors and alloys.*

Global demand for tellurium has grown significantly in recent years owing to increased use in solar cells in the United States and Europe, thermoelectronics (especially in China) and steelmaking worldwide. Estimated global production, however, has remained relatively unchanged over the same period, while accumulated inventories have been exhausted, leading to a supply shortfall.

Tellurium metal's major use is as an alloying additive in steel to improve machining characteristics. Tellurium chemicals are used in the processing of rubber, as a component of catalysts for synthetic fiber production, and as pigments to produce various colors in glass and ceramics, among other applications.

High-purity tellurium is used in electronics applications, such as photoelectric and thermoelectric devices. Thermal imaging devices use a compound of tellurium — mercury-cadmium telluride, which assists in converting a raw image into a crisp picture on the screen. In the last 10 years, tellurium also has increasingly been used in the production of solar cells.

A semiconducting compound of tellurium is used in thermoelectric cooling devices, such as summertime beverage coolers. Thermoelectric coolers are most commonly used in military and electronics applications, such as the cooling of infrared detectors, integrated circuits, laser diodes and medical instrumentation. Their application in consumer products, such as portable coolers for food and beverage and automobile car seat cooling systems, continues to increase.

Although tellurium is widely distributed in nature, it has a low average abundance in Earth's crust and does not occur in concentrations high enough to justify mining rocks solely for their tellurium content. Thus, tellurium is usually recovered as a byproduct of nonferrous metal mining, largely from the copper refining process.

U.S. reserves of tellurium, about 3,000 metric tons, are estimated to be about 14 percent of the world's total reserves.

Owing to the growing supply shortfall, the price of tellurium jumped from \$10 per pound at the beginning of 2004, to \$110 per pound at the beginning of 2006, a 1,000 percent increase. Although tellurium is recovered as a byproduct of copper production, its rate of production may not be directly influenced by copper's industrial demand: Even though global copper production has increased over the past five years, the production of tellurium is believed to have remained essentially unchanged. That's because increased copper output has come from ores with low-tellurium content and from ores processed through leaching, which precludes the recovery of tellurium.

In 2005, the only U.S. domestic producer of refined tellurium had significantly reduced output owing to an extended strike by copper miners. While substitutes exist for tellurium for most of

its uses, they usually incur losses in product efficiency or product characteristics. Unless alternative sources of tellurium are found, tellurium's future use will likely be restricted to the more specialized, high-value-added applications.

Originally published as *Geotimes* Mineral Resource of the Month, August 2006  
Used with permission.



Ultra pure tellurium crystal. Image from Dschwen.