

Silver

William E. Brooks, a U.S. Geological Survey mineral commodity specialist, has compiled the following information on silver, an ancient commodity with many modern applications.

Silver has been used for thousands of years as ornaments and utensils, for trade and as the basis of many monetary systems. The metal has played an important part in world history. Silver from the mines at Laurion, Greece, for example, financed the Greek victory over the Persians in 480 B.C. Silver from Potosi, Bolivia, helped Spain become a world power in the 16th and 17th centuries. And silver from the gold-silver ores at the Comstock Lode in Virginia City, Nev., helped keep the Union solvent during the Civil War.

The primary source of silver is argentiferous galena, as it is relatively abundant and relatively easy to smelt. However, there are many other ores of silver, including acanthite, anglesite, argentite, cerargyrite, cerussite, proustite, pyragyrite and stephanite, and it also occurs as a native metal. Silver may be present in many geologic environments, and byproduct silver may be obtained from the processing of copper, gold and lead-zinc ores. More than two-thirds of U.S. and world resources are contained in such polymetallic deposits and the remainder is found in silver deposits.

Silver's traditional end uses include coins and medals, common retail and industrial applications, jewelry and silverware, and photography. The consumption of silver in common retail and industrial applications has increased and includes the use of silver in bandages for wound care, batteries, solar cells, catalytic converters for automobiles, cell phone covers to reduce the spread of bacteria, clothing to minimize odor, for wood treatment to inhibit mold and water purification. Silver and mercury, the components of dental amalgam, are biocides and their use prevents recurrent decay. Silver is also widely used in miniature Radio Frequency Identification Antennas, which are used in passports and on packages to track shipments. The physical properties of silver that make it so useful include ductility, electrical conductivity, malleability, reflectivity and biocidal properties.

In 2005, approximately 99 percent of U.S.-produced silver came from base-metal ores at 15 mines and from precious-metal ores at 10 mines in 11 states. Alaska led the country, followed by Nevada, known as the "Silver State," and Idaho, famous for the Coeur d'Alene District in the Silver Valley. With about 1,100 metric tons of silver production in 2006, at a value of \$400 million, the United States ranked 8th in the world, and held an estimated 9 percent of the world's silver reserves. Approximately 1,000 metric tons of silver was recovered from scrap in the U.S. in 2006, and 60 to 90 metric tons of silver were reclaimed and recycled from photographic wastewater.

In 2003, the average price of silver was \$4.91 per troy ounce. By 2006, it was up to \$11.20 per troy ounce, and it continues to rise thanks to demand for its many applications as well as a new investment category — the silver exchange traded fund or ETF. In April 2006, the ETF was established, and physical silver destined for use for industrial or other purposes was diverted and held by an investment agency.

Tantalum and titanium may replace silver in surgical applications, and aluminum and rhodium may be used to replace silver in mirrors and other reflective applications. Germanium may be added to silver flatware to help keep tableware from tarnishing. But silver will not lose its place of importance, as its modern uses continue to increase.

Originally published as *Geotimes* Mineral Resource of the Month, August 2007
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Sample of silver ore. Image from *Minerals in Your World*.