

# Lead

*U.S. Geological Survey Lead Commodity Specialist Gerald R. Smith has prepared the following information on lead — one of the world's most widely used and recycled metals.*

The United States is a major producer and consumer of refined lead, representing almost one quarter of total world production and consumption. Two mines in Alaska and six in Missouri accounted for 97 percent of domestic lead production in 2002. The United States also imports enough refined lead to satisfy almost 20 percent of domestic consumption. Other major producers or consumers of refined lead in the world are Australia, Canada, China, France, Germany, Italy, Japan and the United Kingdom.

Lead is a very corrosion-resistant, dense, ductile and malleable blue-gray metal that people have used for at least 5,000 years. Ancient Greeks and Romans used lead for building materials, pigments for glazing ceramics and pipes for transporting water. The castles and cathedrals of Europe contain considerable quantities of lead in decorative fixtures, roofs, pipes and windows. And in the United States, early uses of lead were in ammunition, brass, burial vault liners, ceramic glazes, leaded glass and crystal, paints, pewter, solders and pipes.

In the 20th century, however, the phenomenal growth of motor vehicle manufacturing dramatically altered the market profile for lead, as demand grew for its use in starting-lighting-ignition (SLI) batteries and gasoline additives. Use of lead in the production of such batteries for motor vehicles accounted for 70 percent of the reported consumption of lead in the United States by 2003. In addition, lead use increased in batteries for a wide range of vehicles that are not gasoline-powered, including wheelchairs, golf carts, airport ground-support equipment, industrial forklifts and mining vehicles.

Other technological advances during the last century further prompted greater use of lead in batteries for uninterruptible and emergency power in hospitals and national defense installations, as well as for telecommunications and computer systems. Lead use in all battery types reached 87 percent of reported consumption by 2003. The use of lead for radiation shielding in medical devices, video displays and military hardware also became important new markets for the metal in the latter part of the 20th century.

Bans on lead — because of health risks to people — essentially eliminated its use in gasoline and paint additives during the past 30 years in the United States. The use of lead in SLI automotive-type batteries, however, has continued to grow steadily. Consequently, domestic recycling of spent lead-acid batteries, particularly SLI batteries, has also risen in response to environmental concerns about lead. By 1980, recovery of lead through the recycling of old scrap in the United States had reached 581,000 metric tons, representing 51 percent of U.S. refined lead production and 69 percent of all refined lead consumed domestically. Today, almost 80 percent of U.S. lead production is derived through recycling under strict environmental standards and satisfies about 80 percent of U.S. refined lead demand. The lead-acid battery, with a 97-percent recycling rate, is now the most highly recycled consumer product in the United States.

Of the 1.12 million metric tons of lead recycled in 2003, about 99 percent was produced by

seven companies with 15 plants in 11 states across the country. Most of the recycled lead was recovered either as soft lead or lead alloys to be reused in the manufacture of lead-acid storage batteries.

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Galena, the natural mineral form of lead sulfide, is the most important lead ore mineral. Image from *Minerals in Your World*.