

History

Lead has been used by humans for many thousands of years, with lead beads discovered as far back as the 7th Millenniumⁱ. Thanks to the ease which lead can be smelted from ore, its softness and relatively low melting point it is an easy metal to work. Thanks to this, lead has been extensively used by humans throughout history for a wide range of applications. Until the industrial revolution the most prolific producer and user of lead has been the Roman Empire, which produced up to 80,000 tonnes per annum. Much of this was produced as a by-product of silver mining and smelting as the roman monetary system was built upon silver. The most extensive use of lead by the Romans was in plumbing, which is where the word 'plumbing' is derived from, as the Latin for lead is *plumbum*. For much of history, lead and tin were associated together to such a degree that lead was known as *plumbum nigrum* – black lead while tin was called *plumbum candidum* – bright or white lead. While lead plumbing can contribute to lead poisoning, this is highly dependent on the acidity of the water and its harness or softness. The use of lead in plumbing has been stopped in most of the world due to the risk of lead seepage into drinking water.



Galena, the principle mineral ore of Lead
Source: Rob Lavinsky, iRocks.com – CC-BY-SA-3.0

Geology

Lead rarely occurs as a native metal, so it is sourced from a variety of ores. The most important commercially significant lead ore is Galena (lead sulphide which is 86.6 per cent lead in theory) and other minerals which are either associated with or derived from galena deposits. These include: jamesonite, and boulangerite; anglesite which is a product of galena oxidation, and cerussite which forms from galena decomposition; pyromorphite, also known as green, brown or variegated lead ore; vanadinite; wulfenite or yellow lead ore; crocoite; and phosgenite or horn lead. Other metals frequently found in lead bearing ores are zinc, copper, arsenic, tin, antimony, silver, gold, and bismuth. About 70 per cent of lead and zinc production worldwide is accounted for by dual mining operations where both metals are extracted from the same ores, furthermore some 70 per cent of world silver production is a by-product of lead miningⁱⁱ.

Victoria

Mineral deposits containing lead have been identified at many locations around Victoria however, to date the individual deposits identified have generally been small in scale which has so far prevented significant lead production with only approximately 800 tonnes of lead ore recorded to have been mined. The majority of these deposits are in East Gippsland. For the majority of Victoria's lead bearing deposits, galena is the main mineral ore which is commonly associated with sphalerite and chalcopyrite formationsⁱⁱⁱ. At present there are no active lead mining projects in Victoria.

Use

Lead is a lustrous metallic bluish-white colour when freshly cut, although it tarnishes to a dull greyish-blue on exposed to air. When molten, lead is a brilliant silvery-chrome liquid which resembles mercury. Lead is also dense, highly malleable and resistant to corrosion. Lead is a heavy metal which is highly toxic to animals, including humans, if absorbed into the body through ingestion or inhalation. Lead poisoning affects all organs of the body but the central nervous system is the most significantly affected. It is for this reason that in Australia, lead is no longer used in many products where people may be exposed to it in such a form that it could be absorbed.

Although lead is no longer used in plumbing it is still an important metal used in a range of applications essential to the modern world. About 80 per cent of global lead use is accounted for in batteries. The uses for the remaining 20 per cent include underwater cable sheathing, solder, casting alloys, chemical compounds, ammunition, glassware and radiation shielding for industrial, scientific and medical purposes. Lead is also recycled on a huge scale with almost half of global lead demand satisfied by recycled lead.

Australia's economic resources of lead are the largest in the world at 39 per cent and Australia is the second highest producer of lead after China^{iv}. Australian lead production from mining was 560kt in 2011^v, out of a global total mine production of 4,645kt. Total world demand for lead was 1,0418kt^{vi}.



Pure Lead bead

Source: Hi-Res Images of Chemical Elements – A Virtual Museum
<http://images-of-elements.com/lead.jpg>

ⁱ Heskell, Dennis L. (1983). "A Model for the Adoption of Metallurgy in the Ancient Middle East". *Current Anthropology* 24 (3): 362–366.

ⁱⁱ Sutherland, C. A., Milner, E. F., Kerby, R. C., Teindl, H., Melin, A. and Bolt, H. M. (2005). *Lead*. Ullmann's Encyclopedia of Industrial Chemistry.

ⁱⁱⁱ Victorian Government, Department of Primary Industries: Lead Fact Sheet <http://www.dpi.vic.gov.au/earth-resources/minerals/metals/lead>

^{iv} Geoscience Australia (2012) Australia's Identified Mineral Resources 2011. Geoscience Australia, Canberra. https://www.ga.gov.au/image_cache/GA20563.pdf

^v U.S. Geological Survey, Mineral Commodity Summaries (2012) Lead <http://minerals.usgs.gov/minerals/pubs/commodity/lead/mcs-2012-lead.pdf>

^{vi} International Lead & Zinc Study Group (2012) Lead and Zinc Statistics <http://www.ilzsg.org/static/statistics.aspx?from=3>