ANTIMONY – Sb

History

Antimony has been used by humanity since antiquity. Metal objects and tools made from alloys which included antimony were discovered in ancient Mesopotamia, Egypt and across the Roman Empire. There is, however, ongoing archaeological debate regarding how well antimony was known by ancient metallurgists as a distinct metal. Lead and antimony were regularly confused and considered different types of lead due to the similar appearance of the three metals and because antimony and lead regularly occur together. Stibnite, the principal mineral ore that antimony is extracted from today, was also used as a pigment for makeup and paint when ground to a powder and mixed with fat. In fact stibnite was commonly referred to as antimony leading to confusion about historical antimony use[i].

Antimony was "rediscovered" in the Middle Ages and its usefulness soon saw it incorporated into emerging technologies. When Gutenberg invented the printing press in the 1400s, antimony was indispensable in the inventions' success as it was used as the type metal. Antimony was also used extensively in the late 19th and early 20th centuries in Lead-Acid batteries which were integral to the development of the automobile and the manufacture of munitions – both causing antimony production to sky rocket during the First and Second World Wars.

Geology

The main commercial source of antimony is from the mineral stibnite which occurs predominantly in hydrothermally formed veins. Antimony deposits are found in rocks of a variety of geological ages, and types and in a variety of locations[ii]. Historically, the only metal more economically important to Victoria than antimony has been gold[iii]. Currently antimony is mined at the Costerfield mine where it is extracted from the gold-bearing quartz veins which are hosted in Silurian siltstone. The veins around the Costerfield site have been worked on and off since 1860, with the most active periods being 1860 to 1883 and 1904 to 1925. Exploration and small sc ale mining continued from 1934 to 1997. The current mine has operated since 2006 at the Augusta deposit which was identified by exploration conducted between 1969 and 1977[iv].

Stibnite crystals
Source: Wikimedia Commons

Use

Today the vast majority of antimony mined is consumed in the manufacturing process for plastics and polymers where, in its trioxide, pentoxide, or (especially) sodium antimonite form, it functions as a fire retardant. The most common current use of antimony is as a fire retardant, accounting for around 60 per cent of global consumption. Antimony is also frequently alloyed with lead to improve its hardness and durability. The most common application of such alloys is batteries, but depending on the amount of antimony included there are many other applications where it is highly useful, these include roofing and guttering, ammunition, solder and many more. Refined antimony is mostly used for Lead-Acid batteries. In the form of Sodium Antimonite it is used in the manufacturing of extremely high-quality transparent glass for computer monitors and television screens[v].

Global antimony production in 2011 reached a historical high of 203,500t. This was primarily driven by the huge demand in China's industrialisation. Chinese mines produced 70 per cent of global output in 2011. China is overwhelmingly, the world's largest producer and consumer of antimony[vi].

Ultrapure metallic antimony
Source: Hi-Res Images of Chemical Elements – A Virtual Museum
http://images-of-elements.com/antimony.php

Victoria

Additional opportunities for antimony mining exist in other locations in Victoria as Stibnite Sulphide deposits commonly occur in the Silurian-Lower Devonian sediments of the Melbourne zone. Stibnite is also found in the Ballarat, Bendigo and Fosterville gold fields where it has historically been discarded as a waste product of mining the gold bearing reefs of the area[vii]. The silver–lead ores of eastern Victoria also contain the mineral bournonite, which is 24.9 per cent antimony[viii].

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[i] For a more in depths discussion on ancient metallurgy see: Forbes, R.J. (1950) *Metallurgy in Antiquity: A Notebook for Archaeologists and Technologists,* Brill Archive. Also see: Moorey, P.R.S (1999) *Ancient Mesopotamian Materials and Industries: The Archeological Evidence.* Eisenbrauns

[ii] Anthony, J.W, Bideaux, R.A. Bladh, K.W. and Nichols, M.C. Eds. (2012), *Handbook of Mineralogy, Mineralogical Society of America*, Chantilly, USA. http://www.handbookofmineralogy.org.

[iii] Victorian Department of Primary Industries (2012), Earth Resources, *A* http://www.dpi.vic.gov.au/earth-resources/minerals/metals/antimony

[iv] Mandalay Resources (2012) *The Costerfield Gold-Antimony Mine* http://www.mandalayresources.com/index.cfm?pagepath=Geography/Australia/__Costerfield_Mine&id=20485

[v] Butterman, W.C. and Carlin,J.F. Jr (2004) *Mineral Commodity Profiles: Antimony*, U.S. Geological Survey, U.S. Department of the Interior.

[vi] Roskill, *Antimony: Global Industry Markets and Outlook, 11th edition 2012*

[vii] Weston, K.S., 1992. *Minerals of Victoria*. Geological Survey of Victoria Report 92

[viii] Victorian Department of Primary Industries (2012), Earth Resources, *A* http://www.dpi.vic.gov.au/earth-resources/minerals/metals/antimony; and Ibid Anthony, J.W, Bideaux, R.A. Bladh, K.W. and Nichols, M.C.