

History

Historically, due to the rarity of Platinum group metals (PMGs) they were either unknown or unappreciated by early European metallurgists and miners. The Spanish Conquistadors of South America named the metal "platina," or little silver, when they first encountered it, regarded platinum as an impurity in the silver they were miningⁱ. Native South Americans on the other hand had been using it extensively for a long timeⁱⁱ. PMGs as a whole were identified separate metal from gold and silver by European chemists from the mid-16th century, however, it took until the mid-18th century for platinum to be identified as a pure element in its own right. It was not until the 19th century that it was discovered that natural platinum contained palladium, rhodium, osmium and iridium as well.

Geology

PMGs are a group of six metals which share similar chemical properties and are grouped together on the periodic table of elements. The six PMGs are Ruthenium, Rhodium, Palladium, Osmium, Iridium, and Platinum. They tend to occur together in the same mineral deposits so are generally mined together. Naturally occurring native platinum alloys contain all six of the platinum group metals. The most commercially significant of the PMGs are platinum, palladium, and rhodium.

PMGs are generally found in ultramafic rocks which contain enough sulfur to form a sulfide mineral when the magma is still in fluid state. The sulfide mineral (usually pentlandite, pyrite, chalcopyrite or pyrrhotite) gains platinum by mixing with the bulk of the magma because platinum is chalcophile and is concentrated in sulfides. Alternatively, platinum occurs in association with chromite either within the chromite mineral itself or within sulfides associated with it.

Australia is a very minor player in the global PMG supply market with the annual national production of PMGs equating to less than 0.2 per cent of global supply. Australia's Economic Demonstrated Resources of PGMs is around 5 tonne in Western Australia and the Northern Territory although the Total Identified Resources of PGMs amounts to about 300 tonnes. World production of PGMs is dominated by South Africa which contains the vast majority of the world's known PGMs, followed by Russia with minor contributions from Canada, Zimbabwe, the USA, and Colombiaⁱⁱⁱ.

Victoria

In Victoria PGMs were discovered near the Thomson River sometime around 1864. The site has been intermittently mined since then, producing around 13 200 tonnes of ore. From this only about 10kg of platinum was actually extracted. In 1981 an exploration survey estimated the resource at Thompson River held up to 40,000 tonnes of ore averaging 3.2g/t Platinum, 3.6g/t Palladium, 2.7% Copper, 9.5g/t Silver and 2.5g/t Gold^{iv}.

Use

Today PGMs are used extensively in technological and industrial applications where their high resistance to corrosion and heat is valued. Osmium, iridium, and platinum are the densest metals known and have some of the highest melting points of all metallic elements (between 1550 and 3030 °C). They also are hard-wearing, highly reflective, brittle, malleable, electrically and thermally conductive and have unique catalytic characteristics.

ⁱ U.S. Department of the Interior, U.S. Geological Survey, Minerals Information, Platinum-Group Metals
<http://minerals.usgs.gov/minerals/pubs/commodity/platinum/index.html>

ⁱⁱ Weeks, M. E. (1968). Discovery of the Elements (7 ed.). Journal of Chemical Education.

ⁱⁱⁱ Geoscience Australia, Minerals, *Platinum-Group Elements* <http://www.ga.gov.au/minerals/mineral-resources/platinum.html>

^{iv} Victorian Department of Primary Industries (2012), Earth Resources, Platinum group metals <http://www.dpi.vic.gov.au/earth-resources/minerals/metals/platinum>