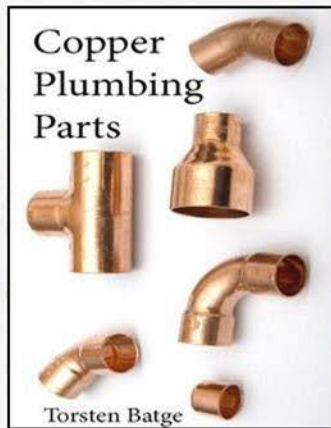


Bill's Rocks and Minerals

Copper (Cu): An everyday mineral.

Copper is one of the most common and recognisable minerals, in fact it is so recognisable and well known that even most children know what it looks like. It can be seen around the home in the form of copper wiring, copper piping, and copper utensils.



Copper Plumbing Parts
Torsten Batge

Copper is a transition metal. It has an atomic number of 29 and atomic weight of 63.546. It occurs in native form as a face centred cubic crystal. It also occurs as a polycrystal (minute crystals in a random arrangement). It is

one of the few minerals that can occur in a directly usable form. A very comprehensive description of copper and its physical parameters can be found in an interactive version of the periodic table, at www.ptable.com

Copper is most commonly found as an ore in porphyry deposits, which account for about two-thirds of known global resources. Porphyry deposits are formed on the sea-bed by volcanogenic activity, usually as chalcopyrite, (CuFeS_2) or less commonly as chalcocite (Cu_2S) or bornite (Cu_5FeS_4). Porphyry deposits also occur as carbonates, such as azurite ($\text{Cu}_3(\text{CO}_3)_2(\text{OH})_2$) or malachite ($\text{Cu}_2\text{CO}_3(\text{OH})_2$). Parys mountain in Anglesey, recently visited by the club is a massive sulphide deposit formed in the late Ordovician period about 441 Ma. Most copper is found as an ore which requires crushing and separation from the ore body, with a good ore having a content of 10% copper.

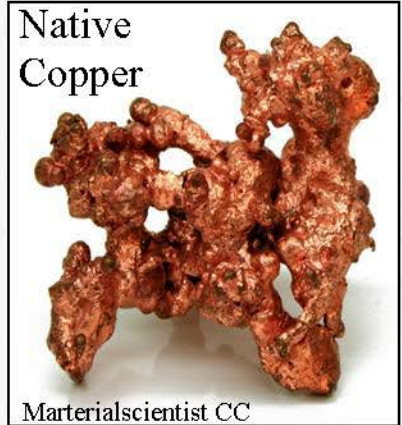
Copper crystals



James St. John

Another major source of copper are sedimentary deposits, which account for about

a quarter of the world's known resources, for instance there are particularly large deposits in the African copper belt, and in the eastern European Zechstein basin. Copper is a native mineral, and is one of the few minerals that occur in a natural state, albeit, not in major deposits. There have been instances of small native deposits being found at Parys mountain, for instance, in 1800 there were reports of lumps of native copper being found with weights of about 30lbs (13.6kg). There have been exceptional discoveries of native copper in large amounts, one of the largest was found in the Keweenaw peninsula, Michigan, USA, and it weighed 420 tonnes.



Native Copper
Marterialscientist CC

Copper is one of the first minerals to be used by early man as long ago as 9000 B.C. Its low melting point of 1084°C enabled it to be smelted in a wood fire, and this was exploited by the Mesopotamians around 5000 years B.C. The Romans mined copper in Cyprus, and it is from this era that copper derived its name, *aes cyprum* (metal of Cyprus). It was later corrupted to *cuprum*, and later still became copper in the English language. Ancient civilizations, including the Romans, used alloys of copper to make utensils, coinage, and ornaments.



Roman Copper coins

The Portable Antiques Scheme
The Trustees of the British Museum

Alloys were used because it was discovered that the addition of small amounts of other metals, up to 30% in the smelt, created a harder wearing metal than the original copper. Copper by itself is very soft, classed as only 3 on the Mohs scale and is easily deformed, making it unsuitable for making tools and some domestic items, whereas the addition of other metals creates a whole range of different copper alloys, used for different purposes, dependant on the additional metal content. The addition of 30% zinc creates brass, and 10% of tin creates phosphor bronze. There are many other copper alloys, each having been designed to fulfil a particular function. While

Copper Kettle.



Public Domain, Wikimedia C.C.

not a copper alloy, but a gold alloy, copper is a constituent part of most gold jewellery, added to give both strength and colour, for instance 18ct. yellow gold has 10% copper content, 22 ct.

yellow gold has 2% copper content, and 18 ct. rose gold has 22% copper content. Pure copper is used to make wrist bracelets, which are wrongfully supposed to help alleviate painful joint conditions.

During the 1770s and 1780s it became apparent that sheathing the wooden hulls of sailing ships with copper

overcame the problem of wood rot due to shipworms, barnacles, and seaweed. The copper was impervious to worms and barnacles, and had the added advantage of acquiring a poisonous surface film on contact with sea water, which deterred weeds from attaching to the hull, and hindering the speed of the ship. The British were at the

forefront of implementing this practice, first with merchant ships and then naval ships. The ships spent much less time in harbour being maintained, with the added bonus that they were faster in the water. The whole naval fleet, some 200+ vessels, were sheathed in copper, with each of larger naval ships requiring 15 tons of copper. The bulk of the copper came from Parys mountain in Anglesey, and was used not only on British ships, but used worldwide. Later years saw the development of copper based paint which was applied to hulls, and served the same purpose. Modern use of copper as sheathing continues today in the form of copper-nickel alloys which are used as cladding on oil rigs, sea based wind turbines, and other marine applications. Copper is also being used more regularly in architecture with some really large buildings having a copper façade.



Copper façade of Nordic Embassy, Berlin

Manfred Bruckels

Wikimedia Creative commons

Copper is a constituent component of naturally occurring minerals, for instance Azurite is a copper carbonate, Malachite is another carbonate, and Turquoise ($\text{CuAl}_6(\text{PO}_4)_4(\text{OH})_8 \cdot 4(\text{H}_2\text{O})$) is a hydrated phosphate of copper and aluminium, all of which are used to make items of jewellery. It is obvious that both manufactured, and naturally occurring alloys of copper illustrate the ease that copper bonds with other minerals in a process known as metallic bonding.

Copper is an essential trace mineral in the human body, and is a component in numerous intracellular metalloenzymes. These metalloenzymes are essential in the synthesis of haemoglobin, elastin, collagen, and norepinephrine. It is also involved in iron absorption, a deficiency of which results in iron

deficiency anaemia. It is also vital in maintaining normal functioning of the thyroid gland, preserving the myelin sheath which protects nerves, and maintaining the health of bones. It is also crucial in the brain and the nervous system, playing a role in making neurotransmitters, which are the chemical messengers essential for communication between nerve cells.

Considering the importance of copper in the human body, only a minute amount is needed, between 1.5 and 2.0 mg. per Kg. of body weight, thus someone with a weight of 60 Kg. would have approximately 0.1 gm. of copper. The body itself cannot produce copper, so it is gained from the food we eat, a balanced diet supplying an adequate amount.

Interesting facts about copper

Copper is biostatic, so bacteria will never grow on it's surface.

The Statue of Liberty is made from over 80 tonnes of copper.

Copper is the most recycled mineral. 80% of the copper produced to date is still circulating through recycling.