

# What are minerals?

A mineral is a naturally occurring element or chemical compound that is normally solid and crystalline and that has been formed by geological processes. They usually occur as visible crystals and often these crystals are remarkably beautiful. It is the colour, symmetry and perfection of crystals that is a wonder of the natural world.

Minerals can be pure elements, such as gold or diamond, or can have complex chemistry. For example diamond consists only of the element carbon and gold consists only of, of course, gold. Many minerals are simple combinations of two elements, for example galena (lead ore) consists of lead and sulphur which gives it the chemical formula lead sulphide (PbS) and halite (common salt) consists only of sodium and chlorine which gives it the formula sodium chloride (NaCl). Others are more complex containing many different elements in combination. However, each mineral has a fixed chemical formula.

Each mineral is known as a 'species' and each species has a unique set of characteristics, just like a fingerprint. Minerals can therefore be identified no matter where in the world they are found (or beyond!). Typical characteristics used to distinguish minerals are hardness, cleavage, fracture, lustre, transparency, colour and specific gravity. Another aid to identification is *habit*, the external form or appearance of the crystals.

Minerals are all around us - every rock is made of minerals - but we usually do not notice them. If we examine a piece of granite for example, we will immediately see that it consists of three distinct minerals. The combination and proportion of minerals enables us to identify the rock. Most rocks are mixtures of minerals although some, like pure marble, are made up of only one mineral, but this is unusual.

There are over 4,000 known mineral species, and this number is increasing all the time. Over 1,000 mineral species have been identified from Britain and Ireland which is a remarkably high number considering the limited surface area and is a reflection of the varied geology of Britain, our once-thriving minerals industry and the enthusiasm of many dedicated mineral collectors. Although the term 'mineral' has a specific definition it is also often used by the public in a wider sense to cover anything of economic value that is dug up from the Earth, including rocks.

The best place in Britain to see the immense diversity in the mineral kingdom is the magnificent Mineral Gallery on the first floor of London's Natural History Museum. The museum holds one of the most important and comprehensive mineral collections in the world containing a staggering 350,000 specimens.

There are some natural forms of carbon that are not strictly minerals as they are of organic origin and do not have a crystalline structure but they are nevertheless usually regarded as minerals. One example is jet, the hard, black variety of lignite that takes a high polish. Jet is therefore a fossilised wood and actually a type of coal. Carbon also combines with oxygen and hydrogen to form naturally occurring hydrocarbons such as bitumens and petroleums, which again are not strictly minerals because they are devoid of atomic structure. Classified with the hydrocarbons are amber, which is a natural fossilised tree resin, or sap, which has been buried for millions of years. Often confused with amber is copal or 'copal resin' which is the name given to modern resins from various tropical trees and when buried for longer periods of time it can be close to amber in durability.