QUARTZ ROCKS

Chalcedony is the name given to compact varieties of silica (SiO_2) made up of *minute fibrous and granular quartz crystals* with sub-microscopic pores. Varieties vary from transparent through translucent to subtranslucent. Colourless when pure, it precipitates from silica-bearing solutions and hence forms cavity linings, veins and replacive masses in a variety of rocks. **Agate** and **onyx** may form in the spaces left by gas bubbles or shrinkage in lavas. **Cornelian** or carnelian is a chalcedony with red iron impurities, **bloodstone** is green with red patches, both due to iron impurities, **moss agate** is normally white with moss-like green mineral inclusions, or with black or brown dendrites of manganese oxides ("mocha stone") and **chrysoprase** is green because of nickel impurity.

Jasper and its varieties (red, or in yellows and greens, due to iron impurities, sometimes with inclusions of green chlorite and actinolite), **chert** and **flint** have *minute, randomly-arranged, interlocking quartz crystals* rather than fibres. Like chalcedony, many of the varieties are subtranslucent and may break with a pronounced conchoidal fracture, giving sharp edges.

As well as filling cavities, quartz can *replace existing material*. Where fibrous blue crocidolite asbestos has been replaced by quartz, there may be residual yellow, brown or red iron oxides (**tiger-eye**), or the original colour may remain (**hawks-eye**). **Fossil wood**, with cell walls clearly visible, may be the result of replacement of cellulose and infilling by fine-grained quartz, and limestones can be replaced *en masse* by silica to give another kind of **chert**, in which any original textures and fossil shells may be perfectly preserved. Some *concretions in sedimentary rocks*, notably **flint nodules**, are formed by the mobilization and migration of dissolved silica from siliceous fossils such as sponge spicules contained in the sediment.

Opaline silica is made of *microscopic spheres of quartz*. If they are of comparable size and arranged in regular rows and layers, light can be refracted from them and the rainbow colours of precious opal occur. If the spheres are of different sizes and jumbled together, the material is common opal, which can have the range of colours and inclusions shown by chalcedony, and also replace fossil material such as wood and bone.

Orthoquartzites are sandstones consisting of *quartz grains cemented by quartz*. They are classified as sedimentary rocks. One kind of quartz-rich sedimentary rock found in surface outcrops is termed "silcrete", and formed as a result of *intense weathering by high rainfall*, such as produced the laterites in W.A. The leaching process dissolves the silica which may be deposited in the layers below, cementing and/or silicifying them. A friable sediment may thus be transformed into a splintery, silica-rich rock. **Radiolarite** is a fine-grained rock formed of minute siliceous fossils which is often found *recemented by dissolved silica* from overlying layers. **Spongolite** is largely made from siliceous sponge spicule microfossils.

Quartzite proper is a *metamorphic rock*, usually medium-grained, consisting of recrystallised, tightly interlocking grains of quartz like a 3-D jigsaw puzzle. Rocks like these are metamorphosed quartz sandstones which have been subjected to heat with or without pressure, as a result of contact with a body of molten rock or, more usually, by deep burial due to Earth movements.

The term "quartzite" is used loosely for both sedimentary and metamorphic granular quartz rocks.

Quartz-rich **mylonites** are silica-rich rocks which have been produced by *intense dynamic metamorphism,* usually from granites. They are compact, chert-like rocks with a streaky or banded texture, produced by extreme granulation and shearing of rocks which have been pulverized and rolled out. In the absence of better alternatives, these rocks have been used for stone tools.

Large **quartz crystals** can be found in granitic igneous and metamorphic rocks. There may also be **quartz veins and pods** which consist of *solid masses of large or smaller crystals of quartz*. These are anhedral except where crystal faces have been allowed to develop, for example, into a cavity. If inclusion free the quartz is clear and transparent: if full *of microscopic fluid inclusions* the quartz is milky.