

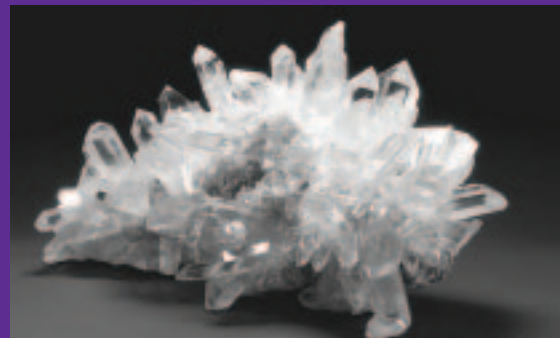


GEOLOGY

THE ROCKS BENEATH OUR FEET

Do you know what the world is made of? The air we breath is mainly nitrogen and oxygen. The rocks that we see around us are also mainly oxygen! But the oxygen atoms in rocks are held rigidly together by other smaller atoms, mainly silicon and aluminium, so the rocks are hard and strong.

Silicon is a silvery metal, like aluminium, but it is much more unstable, and given half a chance any silicon metal will burn - combine with oxygen at a high temperature - to form silica. The glass in windows is a kind of silica. Quartz, the stuff that most beach sand is made of, is also silica. The silicon and oxygen atoms in quartz grains link to form rigid pyramid shapes which don't break easily. Beach and river sand in South Africa consists mainly of small quartz crystals more or less worn down to small rounded particles. As quartz grains are both hard and common, everything else gets ground into finer dust, and is blown away by the wind or washed out to sea, usually leaving clean quartz sand on beaches and in shallow water.



This cluster of quartz crystals is from Arizona. USDA Photo by: Ken Hammond. USDA Image Number: 93cs3951. Source: <http://www.usda.gov/oc/photo/93cs3951.htm>

A naturally occurring solid formed by geological processes with a fixed atomic structure is called a mineral. The word mineral can also be used to refer to something worth digging out of the ground. Here we are using it in a special sense. A mineral has a crystal structure. This is a picture of a cluster of quartz crystals. The arrangement of the atoms gives the quartz crystals a specific shape. They have six sides and their ends are pointed.



Clear Quartz (www.almaleah.com)



Quartz crystal from Arkansas.

Quartz is the most abundant mineral in rock forming the continents (although feldspar is more common in the Earth's crust overall). Quartz is not as hard as Diamond or Corundum, but it is harder than lots of other material. Well-formed crystals may reach several meters in length and weigh hundreds of kilograms. When a quartz crystal is squeezed or twisted - stressed - electrons migrate to one end of the crystal, and this effect can be used to generate an electric current. The reverse is also applicable - a current applied to a crystal will stress it. This is called Piezoelectricity and can be used in clocks, and in cigarette and gas stove lighters.

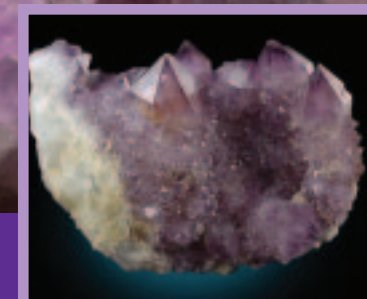
Visit <http://schools-wikipedia.org/wp/q/Quartz.htm>

Sandstone is a rock consisting mainly of sand grains cemented together by natural process.

Quartz crystals come in many colours. Quartz can be white (a variety called milky quartz), translucent (light goes through it) or transparent like glass. But, a quartz crystal can be pink (Rose Quartz), purple (Amethyst), yellow or orange (Citrine), or brown, depending on whether there are atoms other than silicon and oxygen in it to give it colour. Milky quartz fills cracks in rocks. These are called veins and gold was often found in them so they were a target for prospectors. Some **macrocrystalline** (large crystal) varieties are well known and popular as ornamental stone and as gemstones.



Citrine (www.matminerals.com)



Amethyst crystals which formed in a large cavity. (www.i.pbase.com)



Raw Rose Quartz (www.physicereena.com)

Where do quartz grains come from?

Small regularly-shaped quartz grains come from igneous rocks which have a lot of silica in them. An igneous rock is one which solidified from a molten magma. Granite is one of those rocks which has a lot of quartz.

The grey looking mineral is quartz, and it looks grey because it is translucent. The pink mineral is called feldspar. Feldspar is the name of a family of minerals, and their names indicate their chemical content.

This pink feldspar is called plagioclase and contains calcium and sodium, as well as silicon and oxygen. But it is not as hard as quartz so it breaks down to form clay, and can get washed down rivers and out to sea where it will drop to the bottom and form mud.

Together, the feldspar minerals and quartz make up most of the Earth's continental crust.

Here is a piece of Granite.

You can see two different minerals here. One is grey, and one is pink.

