

ROCKS: BACKGROUND INFORMATION

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Rocks compose the crust of the Earth – they make up the mountains and the bottom of the oceans. Rocks are found everywhere on earth, but are often buried under soil or sand. Minerals are the building blocks of rocks. Rocks are made up of minerals like quartz, calcite, feldspars, and micas. Most rocks are made from more than one mineral, but some types of rocks are made of only one mineral, like limestone, which is made entirely of the mineral calcite.

Rocks are classified into three categories according to how they formed: Igneous (from fire), Sedimentary (from sediments), and Metamorphic (changed by heat and pressure). In most cases, we don't see a rock during its formation, so we rely on rocks' observable clues to infer their formations. Two clues that indicate the formation of a rock are its composition and texture. **Composition** refers to what a rock is composed or made of. The color of a rock can provide a clue to the composition. Fragments of other rocks, fossils, and identifiable mineral grains are also aspects of composition. **Texture** is a description of the rock material. It includes characteristics such as crystal size and shape, number of different grain sizes, and alignment of grains.

Composition:

Rocks are made of minerals, but sometimes the mineral grains are so small that you can't see individual grains. If you ground up the rock and analyzed its chemistry you could figure out what elements are present – the composition.

Texture:

Texture is the term applied to the overall appearance of a rock based on the size, shape, and arrangement of the mineral crystals which form it. **Grain Size** refers to the size of crystal grains or fragments:

- **Coarse Grained:** most of the rock is made of grains as large as a grain of rice, or larger.
- **Medium Grained:** the individual grains can be seen without a magnifier, but most of the rock is made of grains smaller than rice.
- **Fine Grained:** the individual grains cannot be seen without a magnifier (or microscope).

Rocks can have the same composition but very different textures. For example, basalt (fine grained) and gabbro (coarse-grained) have the same chemical composition but different textures because of the different ways in which they formed. Basalt is an extrusive rock which cooled quickly; gabbro is an intrusive rock that cooled slowly, allowing for the growth of bigger crystals.

Layers: Layers in rocks show in different ways. Don't be fooled into thinking that all layered rocks are sedimentary; many igneous and metamorphic rocks also show layering. Look closely at the kind of layers and ask yourself some questions:

- Are the layers made up of the **same color but different sized grains**? When grains are deposited in water, they are sorted by grain size and represent a sedimentary rock.
- Are the layers made up of different colored minerals lined up in ribbons? Maybe two colors, often black and white, or green and white, or black and tan or pink? **Ribbon-like layers are found in the metamorphic rock, gneiss.**
 - Rocks that are subjected to heat and pressure can differentiate into layers.
- Lava flows can pile on top of one another, creating a layered appearance. Is the rock volcanic?
- Volcanic ash can be deposited in layers.

Hardness: Some rocks are composed of high amounts of silica, which is harder than glass. Quartzite is a good example. Marble, which can look like quartzite, is composed of calcite and cannot scratch glass, so a quick test to tell the two apart is to see if the sample will scratch glass. If it does not, you most likely have a sample of Marble.

Vesicles (gas bubbles): Small cavities can be formed by the expansion of bubbles of gas or steam during the solidification of the rock (think about an over-pressured can of soda being opened). The presence of vesicles indicates an **igneous rock**. Rock types that display a vesicular texture include pumice and scoria, but basalt, andesite, and rhyolite can also exhibit a vesicular texture.

Fossils: the only rocks that can contain fossils are **sedimentary rocks** (why?). The presence of fossils in a rock indicated that it is a sedimentary rock, most likely a fine- grained sedimentary rock like shale or limestone.

Reaction to acid: Just like calcite, limestone will react with hydrochloric acid to produce carbon dioxide (the fizz). This should not be surprising as limestone is made up almost exclusively of the mineral calcite. Marble, metamorphic limestone, will also react with acid (why?).

Other identifiers: Color can help estimate the amount of silica in igneous rocks. Lighter colored rocks (tans, pale gray) have more silica than darker rocks (black, dark gray). For sedimentary rocks, those deposited in shallower water tend to be lighter in color than those deposited deep in the ocean; sandstone (light) vs. shale (dark).