

# Minerals and Rocks

## Rocks

### .....Read to Learn.....

#### What is a rock?

Sometimes you can tell how an object was made simply by looking at the finished product. If someone serves you eggs for breakfast, you can tell whether they were fried or scrambled by looking at them. In much the same way, a geologist can tell how a rock formed just by looking at it. Two rocks can contain the same minerals. But because the rocks formed differently, they look different.

*A **rock** is a naturally occurring solid mixture composed of minerals, smaller rock fragments, organic matter, or glass. The individual particles in rocks are called **grains**.* The mineral grains in rocks give clues to understanding how the rocks formed.

#### Classifying Rocks

Most of Earth's surface is made of rocks. Geologists classify the different kinds of rocks based on the way the rocks form. There are three major types of rocks: igneous, sedimentary, and metamorphic.

#### Igneous Rocks

There are more igneous rocks on Earth than there are metamorphic or sedimentary rocks. Most igneous rocks form deep below Earth's surface, but some form on Earth's surface. Igneous rocks might form in different places, but they all form in a similar way.

**Formation of Igneous Rocks** Molten rock is called **magma** when it is inside Earth. Molten rock that erupts onto Earth's surface is called **lava**. As magma or lava cools, mineral crystals begin to form. These minerals form the grains of a new igneous rock.

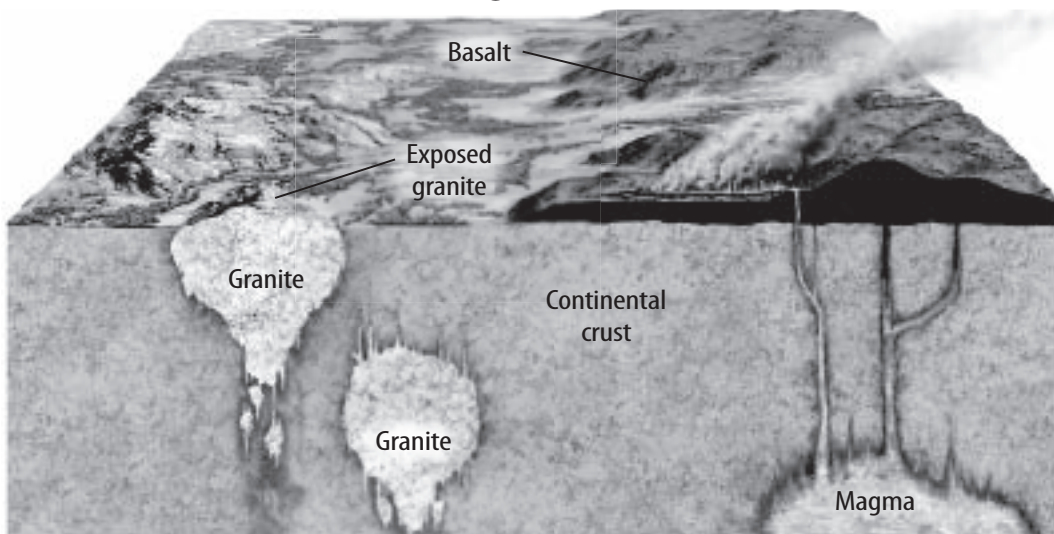
**Texture and Composition** Geologists classify igneous rocks according to texture and mineral composition. For rocks, **texture** refers to grain size and how the grains are arranged.

Lava at Earth's surface cools quickly. As a result, crystals do not have much time to form. The crystals are small, like the crystals in basalt. Geologists describe the texture of igneous rocks with small crystals as fine-grained. Locate the basalt in the figure below.

Deep below Earth's surface, magma cools slowly. The crystals have more time to grow. As a result, the crystals are larger, like the crystals in granite. Geologists describe the texture of igneous rocks with large crystals as coarse-grained. Locate the granite in the figure below.

Igneous rocks such as granite and basalt have different textures. They also have different compositions, or the minerals they contain. Granite contains mostly light-colored minerals such as quartz and potassium feldspar. Basalt is made of dark minerals such as pyroxene (pi RAHK seen) and olivine (AHL ih veen). Granite and basalt are both igneous rocks. However, because of the difference in composition, basalt looks darker than granite.

### Environments of Igneous Rock Formation



## Sedimentary Rocks

Natural processes break down rocks exposed at Earth's surface. *Rock and mineral fragments that are loose or suspended in water are called sediment.*

You have read that magma is a source material for igneous rocks. The source material for sedimentary rocks is sediment.

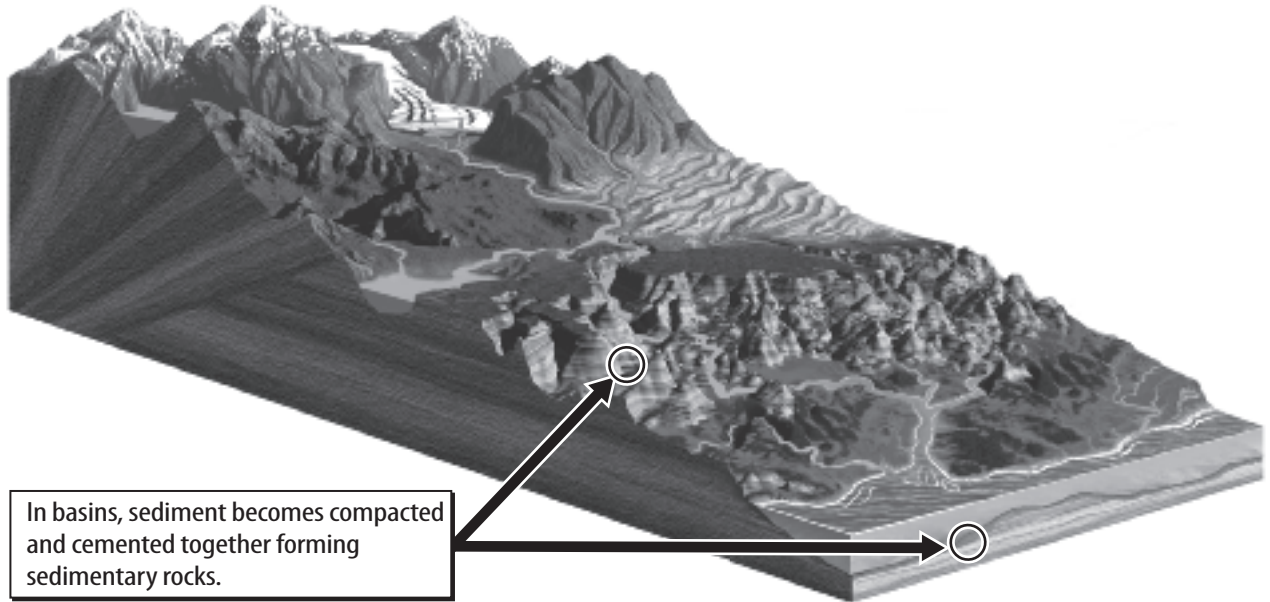
**Formation of Sedimentary Rocks** Study the figure below. How can sediment become solid rock? **Lithification** is the process through which sediment turns into rock.

Usually, sediment is formed through weathering by water, ice, or wind. These agents also remove, or erode, the sediment. Eventually, the sediment is deposited in low areas called basins.

Layers build up as more sediment is deposited in the basins. The weight of this additional sediment compacts, or squeezes together, the lower layers. Dissolved minerals, usually quartz or calcite in water, cement the grains together and form sedimentary rocks such as sandstone and shale.

Dissolved solids also can crystallize directly from a water solution and form sedimentary rocks such as rock salt.

### Environments of Sedimentary Rock Formation



**Texture and Composition** Similar to igneous rocks, sedimentary rocks can be described as fine-grained or coarse-grained. The shape of the grains also can be described as rounded or angular. Grains usually are angular when first broken but often become rounded during transport. This rounded texture of the grains can help distinguish sedimentary rocks from some igneous rocks.

The composition of a sedimentary rock depends on the minerals in the sediment from which it formed. Sandstone is a sedimentary rock that usually is made of quartz grains. Shale is made from much smaller grains of quartz and clay minerals.

## **Metamorphic Rocks**

Sometimes rocks change into different rocks without erosion or melting. Extreme high temperatures and pressure cause these changes. The original rocks are called parent rocks. The new rocks that form are called metamorphic rocks.

**Formation of Metamorphic Rocks** Metamorphic rocks form when parent rocks are squeezed, heated, or exposed to hot fluids. The rocks do not melt. They remain solid, but the texture, and sometimes the mineral composition of the parent rock, change. This process is metamorphism.

**Texture and Composition** The textures of most metamorphic rocks result from increases in temperature and pressure. The mineral composition of metamorphic rocks might result from minerals in the parent rock. Or, the minerals might grow in the new metamorphic rock. You read about gemstones in Lesson 1. Many gemstones are minerals that formed as a result of metamorphism.

**Foliated Metamorphic Rocks** Recall that crystals form in a variety of shapes. Minerals with flat shapes, such as mica, produce a texture called foliation. **Foliation** (foh lee AY shun) *results when uneven pressures cause flat minerals to line up, giving the rock a layered appearance.* Eventually, distinct bands of light and dark minerals form. Foliation is the most obvious characteristic of metamorphic rocks. Gneiss (NISE) is a metamorphic rock that can form from a granite parent rock. Gneiss exhibits foliation typical of metamorphic rocks.

**Nonfoliated Metamorphic Rocks** Marble, a metamorphic rock that forms from limestone, does not exhibit foliation. The grains in marble are not flattened like the grains in gneiss. The calcite crystals that make up marble became blocklike and square when exposed to high temperatures and pressure. Marble has a nonfoliated texture.

## **Rocks in Everyday Life**

Rocks are abundant natural resources. People use them in many ways, based on the physical characteristics of the rocks. Some igneous rocks are hard and durable, such as granite. You might see a fountain constructed from granite. The igneous rock pumice is soft but contains small pieces of hard glass, making it a useful polishing and cleaning product.

Natural layering makes sedimentary rock a high-quality building stone. People use both sandstone and limestone in buildings. Builders use limestone to make cement, which they then use to construct highways and other structures.

Foliated metamorphic rocks split into flat pieces. Slate makes durable, fireproof roofing shingles.

Artists use other metamorphic rocks in their art. Because marble is soft enough to carve, artists often use it to make detailed sculptures.