

section 4 Sedimentary Rocks

What You'll Learn

- how sedimentary rocks form
- how sedimentary rocks are classified

Before You Read

Imagine you are stacking slices of bread, one on top of the other. Then you put a heavy book on top of the stack and leave it there overnight. Describe how the slices of bread might look the next day.

Study Coach

Sticky-note Discussion

Use sticky notes to mark places in the text that you find interesting or that you have a question about. Write your comment or question on the sticky note and stick it to the page.

Read to Learn

Formation of Sedimentary Rocks

Weathering breaks down rocks into sediment. **Sediment** is the loose material, such as tiny pieces of rock, mineral grains, and bits of shell, that are moved by wind, water, ice, or gravity. Sediments come from already-existing rocks that are weathered and eroded.

Sedimentary rock forms when sediments are pressed and cemented together, or when minerals form from solutions. About 75 percent of the rocks you see on Earth's surface are sedimentary rocks.

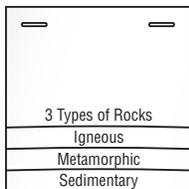
What do sedimentary rocks look like?

Sedimentary rocks often form as layers, like a stack of papers. The older layers are at the bottom because they were deposited first. The newer layers are at the top because they were deposited later. If sedimentary rock is not disturbed, the layers will remain in place, with the oldest at the bottom and youngest at the top.

Sometimes, though, forces within Earth overturn layers of sedimentary rock. Then, the oldest layers are no longer on the bottom. The order of the layers is changed.

FOLDABLES™

B Organize Use your Foldable to help you organize sedimentary rocks into groups based on their characteristics.



Classifying Sedimentary Rocks

Sedimentary rocks can be made of just about any material in nature. Sediments come from weathered and eroded sedimentary, metamorphic, and igneous rock. Sediments also can come from the remains of some organisms. The composition of a sedimentary rock depends on what types of sediments formed it.

Sedimentary rocks are classified by what they are made of. They are also classified by the way in which they formed. Sedimentary rocks are classified as detrital, chemical, or organic. ✓

Detrital Sedimentary Rocks

The word *detrital* (dih TRI tul) comes from the Latin word *detritus*, which means “to wear away.” Detrital sedimentary rocks are made from the broken pieces of other rocks. The tiny pieces are compacted and cemented together to form solid sedimentary rock.

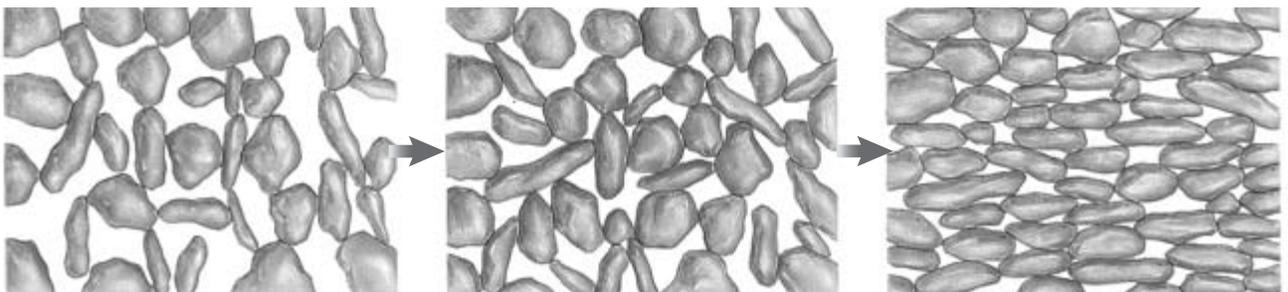
What are weathering and erosion?

Weathering is the process in which air, water, or ice breaks down rocks into smaller and smaller pieces. The movement of weathered material is called erosion.

What is compaction?

Erosion moves sediments to a new place, where they are deposited in a thin layer. Over time, layer upon layer of sediment builds up. The weight of the top layers pushes down on the lower layers. Downward pressure causes small sediments to stick together and form solid rock. The process in which layers of sediments are pressed together to form rock is called **compaction**. The figure below shows how rock pieces are compacted to form sedimentary rock.

Compaction of Sediments



✓ Reading Check

1. **Identify** the three classes of sedimentary rock.

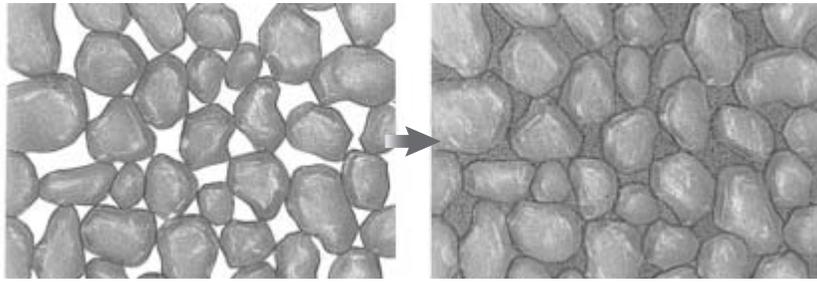
Picture This

2. **Describe** Use a colored pencil to color in the spaces between the sediments in each figure. What happens to the spaces as the sediments form rock?

Picture This

3. **Outline** with your pencil the spaces between sediments where water and dissolved minerals move.

Cementation



What is cementation?

Large sediments, like sand grains and pebbles, cannot form rock from pressure alone. These large sediments form rock only if something helps them stick together.

As water moves through rock and soil, it picks up materials released by the weathering of minerals. The resulting solution of water and dissolved minerals moves through open spaces between larger sediments. The solution acts as a kind of glue that holds the large sediments together. **Cementation** is the process in which sediments are held together by dissolved minerals produced when water moves through rock. Minerals such as quartz, calcite, and hematite make the best cement for holding large sediments together. ✓

What are the shapes and sizes of sediments?

Detrital rocks have a grainy texture, like grains of sugar. They are named according to the shapes and sizes of the sediments that form them. For example, conglomerate and breccia (BRECH uh) are detrital rocks that form from large sediments. If the sediments are rounded, the rock is called conglomerate. If the sediments have sharp angles, the rock is called breccia. The farther sediments are carried by wind, water, or ice, the more rounded they become.

What materials are found in sedimentary rocks?

Conglomerate and breccia are formed from gravel-sized sediments that are cemented together by quartz or calcite. These sediments may come from the minerals quartz or feldspar, or may contain chunks of other rocks, such as gneiss, granite, or limestone.

Sandstone forms from small sediments. The sand-sized sediments in sandstone can come from almost any mineral, though they usually come from quartz and feldspar. Shale is a detrital sedimentary rock that is made from the smallest clay sediments.

✓ Reading Check

4. **Identify** What is necessary for the process of cementation to take place—wind, water, or air?

💡 Think it Over

5. **Infer** Which has probably been carried farther by wind and water—the sediment in conglomerate rocks or breccia rocks?

Chemical Sedimentary Rocks

When water evaporates from a salt solution, salt grains remain. In a similar way, when the water in a lake evaporates, its minerals remain. The remaining mineral deposits form sediments which, in turn, form rocks. Chemical sedimentary rocks form when dissolved minerals come out of solution and form sediments that become rocks. ✓

How does limestone form?

Calcium carbonate is found dissolved in ocean water. Calcium carbonate comes out of solution as the mineral calcite. Calcite forms crystals, which bond to form limestone, usually on the bottom of lakes and shallow seas. Long ago, the central United States was covered with a shallow sea. Over time, the water evaporated. As a result, much of the central United States has limestone bedrock.

How does rock salt form?

Some bodies of water contain a lot of dissolved salts. When the water evaporates, it deposits the mineral halite, or rock salt. Rock salt is mined. It is used in manufacturing glass, paper, and soap. It is also made into table salt.

Organic Sedimentary Rocks

Rocks made of materials that were once living things are called organic sedimentary rocks. One of the most common organic sedimentary rocks is fossil-rich limestone. It is made of the remains of once-living ocean organisms. Ocean animals, such as clams and snails, make their shells out of calcium carbonate, which eventually becomes calcite. When the animals die, their shells pile up and become cemented together to form fossil-rich limestone. ✓

What are other organic sedimentary rocks?

Chalk Chalk is an organic sedimentary rock that is made up of extremely tiny bits of animal shells. When you write with chalk, you are crushing and smearing the calcite shell remains of once-living ocean animals.

Coal Coal is a useful organic sedimentary rock that forms when pieces of dead plants are buried under other sediments in swamps. The plant material is chemically changed. The resulting sediments are compacted to form coal. Today, coal is a fuel used in power plants to make electricity.

✓ Reading Check

6. **Explain** What do chemical sedimentary rocks form from?

✓ Reading Check

7. **Determine** What do all organic sedimentary rocks contain?

● After You Read

Mini Glossary

cementation: process in which sediments are held together by dissolved minerals produced when water moves through rock

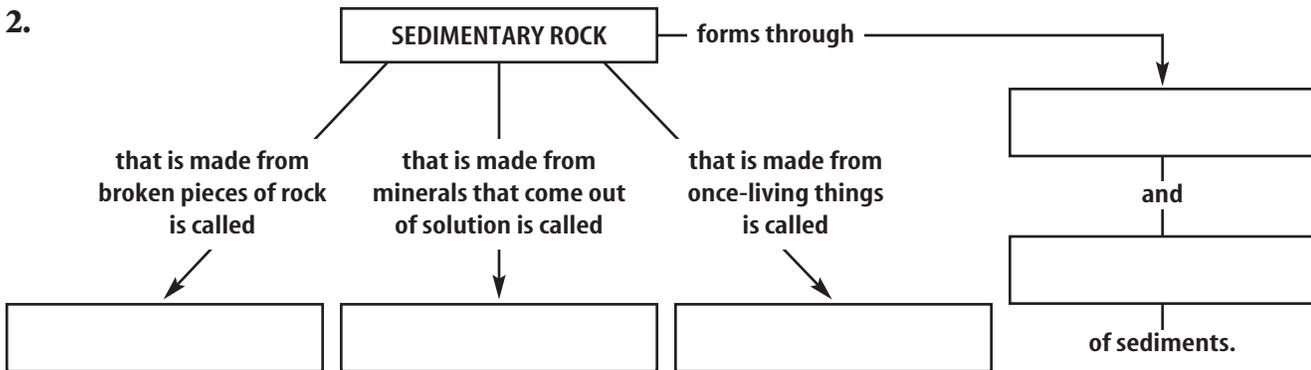
compaction: process in which layers of sediments are pressed together to form rock

sediment: loose material, such as tiny pieces of rock, mineral grains, and bits of shell, that are weathered from rocks and carried by wind or water

sedimentary rock: rock that forms when sediments are pressed and cemented together, or when minerals form from solutions

1. Review the terms and their definitions in the Mini Glossary. Then write one or two sentences that describe how sediments form sedimentary rocks. Use the terms in your answer.

- 2.



3. You used sticky notes to write comments or questions about this section. How did using sticky notes help you understand sedimentary rocks?

