



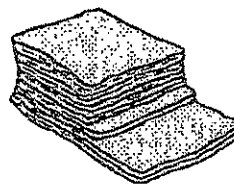
## CHAPTER 5—LAB 2: SEDIMENTARY ROCKS

### Introduction

Unlike for igneous rocks, no single definition can be used to distinguish all sedimentary rocks from those that are not sedimentary. Most sedimentary rocks are composed of the weathered remains of other rocks that have been compressed and cemented in layers. Other sedimentary rocks are left behind when seawater evaporates or when organic remains are compacted and/or cemented by mineral material. Fossil remains of prehistoric life are found almost exclusively in sedimentary rocks.

Sedimentary rocks are classified into three groups on the basis of their origin; that is, how they formed. These three groups are clastic (fragmental), crystalline (mostly chemical precipitates), and bioclastic (organic).

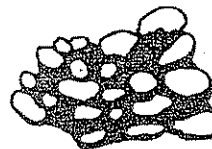
**CLASTIC** (fragmental) rocks are the most common sedimentary rock. They are made from fragments of rocks that were weathered, eroded, and deposited as sediment. The sediment was compressed and cemented to form new rock. Unlike sediment, sedimentary rock is harder because it has been compressed and cemented. Compression is caused by the weight of material deposited on top of the rock layers. Silica (quartz), calcite (limestone), and clay are three common rock-forming cements. These cements are usually deposited by water seeping through the sediments. The clastic rocks are classified on the basis of the size of the grains of sediment. The following are clastic sedimentary rocks. (See Figure 5-5.)



SHALE is made of clay fragments less than 0.004 mm, so shale feels smooth and breaks into thin layers



SANDSTONE is composed of gritty sand grains from 0.004 mm to 0.06 mm.



CONGLOMERATE contains pebbles greater than 2 mm in diameter cemented together.

FIGURE 5-5. Three clastic sedimentary rocks.

- **Shale** is composed of clay particles so small that they cannot be seen without magnification. Shale feels smooth and breaks into thin layers. Although dominated by the clay family of minerals, other minerals can be present if the particles are clay size.
- **Siltstone** is made of slightly larger particles, but it sometimes breaks into thin layers.
- **Sandstone** contains sand particles large enough to feel gritty. Although sandstone may or may not show layering, it usually breaks into irregular fragments.
- **Conglomerate** may look like a piece of cement containing pebbles. It is composed of pebbles, cobbles, or larger rock, rounded particles (fragments) of sediment held together by natural cement.
- **Breccia** is similar to conglomerate, except that its fragments are angular.

Most **CRYSTALLINE** sedimentary rocks are made of soluble materials that precipitated from seawater as the water evaporated. Therefore this group of rocks is sometimes known as the evaporites. Unlike the other sedimentary rocks, most rocks in this group are composed of relatively soft, intergrown crystals. However, you should remember that

most rocks composed of intergrown crystals, such as igneous rocks, are not sedimentary rocks.

As ocean water evaporates, a variety of salts are left behind. **Rock salt** is the first and most abundant compound to precipitate. Sodium chloride (table salt), the mineral halite, is the essential mineral in the sedimentary rock called rock salt. Rock salt is followed in precipitation by other salts. **Rock gypsum** is one of the materials deposited later if evaporation continues. This kind of precipitation is now occurring in the Persian Gulf of Asia, and in the Great Salt Lake in Utah. Underground beds of rock salt in western New York State show that this part of North America was covered by an inland sea or gulf that was rapidly evaporating millions of years ago.

- **Dolostone** forms by a chemical reaction of limestone with seawater. Magnesium is added to the mineral calcite in limestone to change it to dolostone.

**BIOCLASTIC** (organic) sedimentary rocks are made from the remains of plants and animals. They are called organic because the rocks are made from material that was once alive, and because they all contain carbon.

- **Coal** is composed of the remains of plants that lived in tropical swamps millions of years ago. The plant material fell into water where it could not decay as quickly as it accumulated. Compression by burial turned these remains into peat, then lignite, and then into bituminous coal, which are relative low in density. Deeper burial may produce anthracite, commonly called hard coal, because it is harder and more dense than other forms of coal.
- **Coquina** is a variety of limestone composed entirely of bits of seashells cemented by a calcite matrix.
- **Natural chalk** is also composed of the remains of very tiny marine animals that are too small to be easily visible.
- **Limestone** is a sedimentary rock composed primarily of the mineral calcite. Most limestone was formed from shells and other parts of marine organisms. If shells have been abraded into sand-size particles composed of calcite, fragmental limestone is the result. Some calcites may have formed by chemical precipitation. Thus, limestone is a sedimentary rock that has sometimes been classified into any of the three above mentioned sedimentary groups.

## Wrap-Up

Use the Scheme for Sedimentary Rock Identification to answer the following questions. The right side of the Scheme for Sedimentary Rock Identification shows symbols often used to represent various sedimentary rocks on diagrams and maps. In most cases, the symbol shows something about the texture of the rock. For example, shale usually breaks into thin horizontal layers, while sandstone is made of little grains of sand.

1. What is coal made from? \_\_\_\_\_
2. What clastic rock is composed of the smallest grains of sediment?
3. What rock is often represented in diagrams by this pattern? (Figure 5-6)

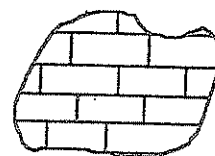


FIGURE 5-6.

5. In what way is breccia unlike conglomerate?

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6. What is the largest diameter of rock fragment generally found in siltstone?

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7. What common sedimentary rock is composed mostly of the mineral calcite?

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8. What three minerals or mineral families dominate all the clastic sedimentary rocks?

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9. If a rock is made of grains mostly about 1 mm across, what kind of rock is it?

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10. Although Earth is mostly igneous rock, most of the bedrock we see at the surface is sedimentary. Why?

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We can usually identify a rock as sedimentary because it has one or more of the following characteristics:

1. It is composed of rounded fragments compressed and cemented together.
2. It is layered, although the layers may be too thick to show in a small sample.
3. It contains fossils. (Fossils are not found in all sedimentary rocks; however, nonsedimentary rocks very seldom contain fossils.)

