

Minerals

Key Words • mineral • crystal • streak • luster • Mohs scale



Getting the Idea

If you have looked closely at rocks, you may have noticed how different they look. Rocks are made up of different substances called minerals. A **mineral** is a solid, nonliving material that is found in Earth. Scientists know of several thousand different minerals. Minerals have similarities, but each mineral has its own unique set of properties.

What Is a Mineral?

Minerals are made up of naturally occurring substances called elements. Elements are the most basic substances found on Earth. They are the smallest “building blocks” of matter. You may be familiar with some elements. In Lesson 15, you learned that Earth’s core is made primarily of two elements: nickel and iron. There are 92 elements found naturally on Earth. Most of the minerals in Earth’s crust are made up of only eight elements. They are oxygen, silicon, aluminum, iron, calcium, sodium, potassium, and magnesium.

To be classified as a mineral, a substance must have a definite chemical makeup. Feldspar, the most common mineral in Earth’s crust, is made up of silicon, aluminum, and oxygen. Quartz, the second most common mineral, is made up of silicon and oxygen. The elements in a mineral are arranged in a regular pattern called a **crystal**.

By definition, a mineral must not be formed by a living thing. A mineral must be found in nature, not made in a laboratory. And it must exist in nature as a solid.

Identifying Different Minerals

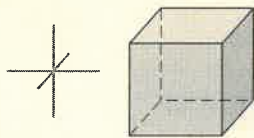
A mineral can usually be identified by its physical properties, or characteristics. These properties include color, streak, luster, crystal shape, and hardness.

Color is easy to observe. However, you cannot always rely on color to identify minerals. Different minerals can have the same color. Some minerals vary in color. The color of these minerals depends on other substances that became part of the mineral when it formed. Quartz is often clear, but it can be purple, pink, or gray. Topaz can be yellow, pink, or blue.

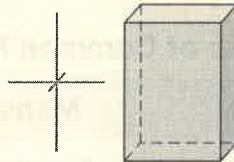
Streak is the color of a mineral in its powder form. If you rub a mineral across a porcelain tile, it may leave a stripe of color. The color you see in the mineral and the color of its streak are not always the same. For example, pyrite looks golden, but it leaves a greenish-black streak.

Luster is the way a mineral reflects light. Luster can be described as *dull*, *shiny*, *greasy*, *pearly*, *metallic*, or *glassy*. Garnet is described as glassy, while pyrite is described as metallic. Talc is described as greasy.

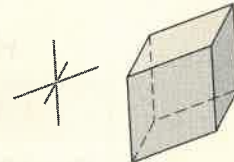
The crystals that make up minerals have different shapes. There are six crystal shapes, shown below. The way the crystals are arranged causes some minerals to break more easily in one direction than another. If a mineral breaks smoothly along a flat surface, it is said to have *cleavage*. Mica is a mineral that has cleavage. It breaks into thin sheets. If the mineral breaks along uneven surfaces, it is said to *fracture*.



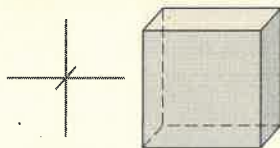
Isometric crystals



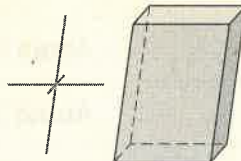
Orthorhombic crystals



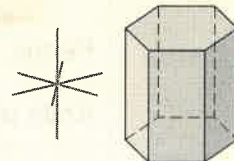
Triclinic crystals



Tetragonal crystals



Monoclinic crystals

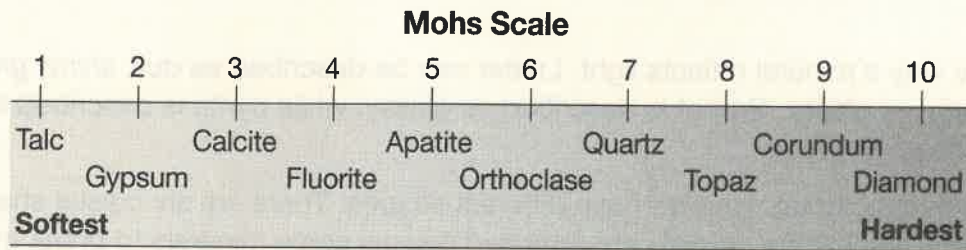


Hexagonal crystals

Hardness and the Mohs Scale

Some minerals are harder than others. Each mineral has a distinct hardness. That means a mineral's hardness is always the same. In 1812, Friedrich Mohs, a German mineral expert, developed a hardness scale based on ten common minerals. The **Mohs scale** ranks the hardness of minerals from 1 to 10, with 1 being the softest (talc) and 10 being the hardest (diamond).

You can test the hardness of a mineral by scratching it against other minerals. A harder mineral will scratch a softer one. A softer mineral will not scratch a harder one. For example, if a tested material is scratched by apatite but not by fluorite, it has a hardness between 4 and 5 on the Mohs scale.



Most of the minerals on the Mohs scale are common. You can also use ordinary materials of known hardness to approximate the hardness of a mineral. If the material scratches the mineral, you know it is harder. If it does not, the mineral is harder.

Hardness of Common Materials

Material	Mohs Scale Rating
Graphite pencil lead	About 1
Fingernail	About 2.3
Penny	About 3.0
Knife blade	About 5.2
Window glass	About 5.5
Steel file	About 6.5
Porcelain streak plate	About 7.0

Other Mineral Properties

Some special properties can help you identify minerals, too. For example, some minerals react with acids. A sample of the mineral calcite will bubble when a drop of acid is placed on it. Most minerals do not react this way.

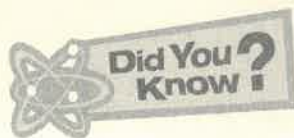
Some minerals are attracted by magnets. Magnetite, a mineral that contains iron, is naturally magnetic. Most other minerals are not magnetic. You can use a magnet to find out whether a mineral is magnetic. A magnetic mineral will be attracted to the magnet.

Some minerals conduct electricity. Others do not. Some minerals, such as fluorite, glow under certain kinds of light. They may give off colors that are different from the colors you see under natural light.

Uses of Minerals

Many metals do not exist as pure substances in nature. People can make metals using some elements in minerals called ores. These ores are mined, and the metals are removed. Then, people combine these metals with other elements. For example, there are several iron ores. Iron can be combined with just a little carbon to make steel. Steel is used to make skyscrapers, ships, cars, paper clips, pins, and many other things. Aluminum ore is a mineral called bauxite. Aluminum is used to make cans, foil, and bicycle frames.

You use products made of minerals every day. The lead in a pencil is not the element lead. It is graphite, a mineral made of carbon. Quartz is used to make glass. Minerals are used in many ways. Some minerals form gemstones. Gemstones such as diamond, topaz, and garnet are used in jewelry. These gemstones are cut along the cleavage lines of their crystals. This shape makes them sparkle in bright light.



Georgia's official state mineral is staurolite. It contains iron, magnesium, zinc, silicon, aluminum, and oxygen. The mineral looks dark, but it leaves a white streak.

Discussion Question

Why do you need to use more than one property to identify a mineral?