

Minerals

Five Characteristics of Minerals

All minerals possess five qualities: they must be solid, crystalline, inorganic, naturally occurring, and have a specific chemical composition.

Study Tip

Fracture is a break that's NOT along a plane while cleavage IS a break along a plane

Laboratory Techniques

The most common laboratory technique to identify minerals is x-ray diffraction.

- X-ray diffraction is a technique where x-ray light shines on a mineral and forms a pattern of light.
- Minerals can be identified through patterns of light

Crystalline Solids

- Minerals are **crystals** where atoms are arranged in a regular repeating pattern
- Minerals are naturally occurring substances, meaning they are not artificial.
- Diamonds found in the Earth's crust are natural minerals but man-made diamonds are not.

Inorganic Substances

- Inorganic substances have structures that are not found in living bodies

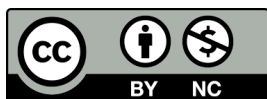
Chemical Composition

Nearly 98.5 percent of Earth's crust is composed of oxygen, silicon, aluminum, iron, calcium, sodium, potassium, and magnesium. Each mineral has its own chemical formula and are made up of **chemical compounds**.

Physical properties of minerals

Minerals are identified by a variety of physical properties:

- **Color:** the color of the mineral, some minerals such as quartz come in many different colors.
- **Streak:** the color of the mineral's powder when it's streaked across a hard surface.
- **Luster:** reflection of light off a mineral's surface (shininess)
- metallic minerals are shiny (gold), non-metallic metals aren't (quartz, salt)
- **Density:** mass/volume, typically reported in "specific gravity" (density relative to water)
- **Cleavage:** the mineral's tendency of a mineral to break along certain planes to make smooth surfaces
- **Fracture:** the pattern in which a mineral breaks (jagged edges, smooth)
- **Hardness:** what minerals it can scratch and what minerals can scratch it, measured by the Mohs hardness scale below



Mohs Hardness Scale: 1 (softest) to 10 (hardest).

Hardness	Mineral
1	Talc
2	Gypsum
3	Calcite
4	Fluorite
5	Apatite
6	Feldspar
7	Quartz
8	Topaz
9	Corundum
10	Diamond

Concept Check

- What are the five qualities that all minerals have?
- What are the physical properties that can be used to identify minerals?
- Describe the chemical composition of the Earth.
- What is the most common laboratory procedure for identifying minerals?