

Rocks and Minerals

Section 2: Mineral Formation & Resources

Minerals usually form through a process called **crystallization**. Crystallization occurs when particles dissolved in a liquid solidify in an orderly, repeating pattern to form crystals. Geologists study a mineral's physical and chemical properties to determine the type of environment in which it formed. Sometimes crystals grow inside hollow spaces in rocks. A **geode** is a rounded, hollow rock often lined with mineral crystals, such as agate, that forms when silica-rich water fills cavities in volcanic rock and slowly crystallizes in layers.

Minerals form in two different ways. The first is through the crystallization of magma or lava. When hot magma cools slowly beneath Earth's surface, or when lava cools quickly at the surface, minerals form as the liquid turns solid. As the material cools, atoms bond together and form crystals. Slower cooling generally allows larger crystals to form. For example, **potassium feldspar** and **biotite** commonly form in igneous rocks such as granite as magma cools slowly underground. Their crystal size can help scientists understand how quickly the magma cooled.

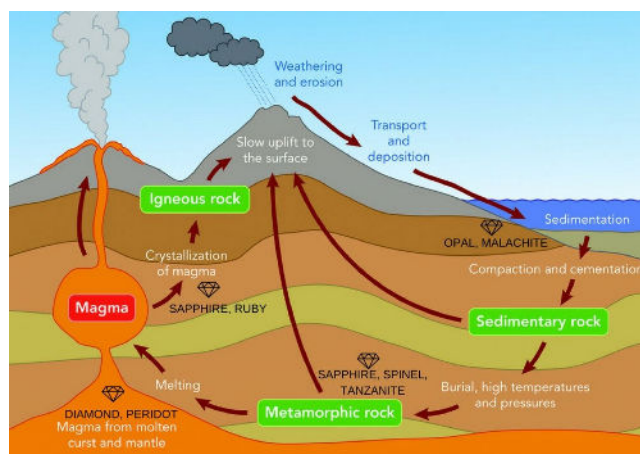


Figure 1 – As magma cools beneath Earth's surface, minerals crystallize and form igneous rock. This process creates interlocking mineral crystals as molten material solidifies.

The second way minerals form is from **solutions** (a mixture in which one substance is dissolved in another). When elements and compounds dissolve in water, they form a solution. If water evaporates or cools, dissolved materials can come out of solution and crystallize. For example, halite (rock salt) and gypsum often form in dry, desert environments where shallow seas or lakes evaporate, leaving mineral crystals behind. These are called evaporite minerals. Some minerals also form from hot water solutions deep underground. For instance, silver can

crystallize from hot, mineral-rich fluids that move through cracks in rocks. When these minerals crystallize within fractures, they form narrow deposits called **veins** that differ from the surrounding rock.

Minerals are extremely important because they are the source of gemstones, metals, and many materials used in everyday products. **Gemstones** are naturally occurring minerals that are valued for their hardness, color, and glassy luster. After a gemstone is cut and polished, it is called a **gem**. Minerals are also the source of useful metals such as aluminum, iron, copper, and silver. A rock that contains enough valuable minerals to be mined for profit is called **ore**.

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Section 2: Mineral Formation & Resources Cont.

To obtain these valuable materials, geologists first locate deposits through **prospecting**. Ore is then removed from the ground through **mining**, and the valuable metals are extracted through a process called **smelting**, which uses heat to separate the metal from the surrounding material.

Review:

1. Explain crystallization.
2. What are the two different ways that minerals can form?
3. What are gemstones?