

Ch 4 Sec 2: How Minerals Form

Guide for Reading

- How do minerals form from magma and lava?
- How do minerals form from water solutions?

A **geode** is a rounded, hollow rock that is often lined with mineral crystals. It is formed in the way that all minerals generally are formed—through **crystallization**, the process by which atoms are arranged to form a material with a crystal structure.

One of the two ways minerals form is by:

1. **crystallization of magma** (cools inside the crust) **or lava** (cools & hardens on the surface)
2. **crystallization of materials dissolved in water.**

When these liquids cool to a solid state, they form crystals.

The size of these crystals depends on several factors:

1. **The rate at which magma cools**

Slow cooling leads to the formation of large crystals.

If the crystals remain undisturbed while cooling, they grow according to a regular pattern.

Magma closer to the surface cools much faster than magma that hardens deep below ground.

With rapid cooling, there is no time for magma to form large crystals.

If magma erupts to the surface and becomes lava, the lava will also cool quickly and form minerals with small crystals.

2. the amount of gas magma contains
3. the chemical composition of magma

Some minerals form from solutions

Sometimes the elements and compounds that form minerals can be **dissolved** in water to form solutions. A **solution** is a mixture in which one substance is dissolved in another. When elements and compounds that are dissolved in water leave a solution, crystallization occurs. Minerals form in this way underground & in bodies of water.

Minerals form when solutions evaporate

For example, deposits of the mineral halite, or table salt, formed over millions of years when ancient seas slowly evaporated. This occurs in the Midwest, Southwest and Gulf coast. Other useful minerals that can form by evaporation include gypsum and calcite.

Some minerals form from hot water solutions.

Pure metals that crystallize from hot water solutions underground often form veins. A **vein** is a narrow channel or slab of a mineral that is different from the surrounding rock.

Magma heats the water underground → elements & compounds dissolve in hot water to form solutions → the solutions follow cracks within the rock → elements & compounds leave the solution during cooling and crystallize as minerals → these minerals form a narrow channel or slab in the rock called a vein.

Where minerals form: Both occur through crystallization

Minerals can form **on the surface** through evaporation of **solutions** containing **dissolved** minerals.

Minerals can form **beneath the surface** when dissolved elements and compounds leave a hot water solution or when materials **melted** in **magma/ lava** then cools & hardens.