

Mineral Uses and Formation

Mineral Formation

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SUMMARY

Minerals form by natural processes. What are these natural processes? There are many such as molten rock cooling and evaporation leading to crystallization.

- There are a variety of natural processes that form minerals. In any case, minerals develop when atoms of one or more elements join together and crystals begin to “grow.” (Note: the crystals aren’t growing. They are simply becoming bigger. Much like a line for a rollercoaster: as more people enter the line, the line gets longer.)
- There are three factors that control which minerals form.
 - Element availability: Because minerals have their own chemical makeup, the type of mineral that will form in an area depends on which elements are available.
 - Heat and Pressure: In addition, the temperature and pressure around the minerals will affect which minerals form.
- There are five ways minerals can form.
 - Water evaporation (leads to crystallization)
 - Hot water cooling (leads to crystallization)
 - Molten rock cooling (leads to crystallization)
 - Heat and pressure cause changes (re-crystallization)
 - Organisms producing minerals

Crystallization through water evaporation

- Water usually has many substances dissolved in it.
- When the water evaporates, the substances can crystallize. Crystallization is the process in which the molecules of minerals bond to form crystals.
 - Example: When you dissolve salt into water, you break the molecules separate from each other (note: the bonds connecting the atoms in the molecules do not break!). When the water evaporates, the molecules join together and begin to form a crystal.
- Examples of minerals that form through this process are gypsum and halite.

Crystallization through the cooling of water

- Hot water moving through the earth’s crust can dissolve minerals.
- When the water cools the minerals crystallize and become solid again.
- This process can move minerals from one location to another.
- This process is what forms veins of minerals—a long narrow channel of minerals sharply different from the rocks around it. An example of this is gold.

- In some cases, the minerals that form are different from those that dissolved. This is because the atoms can bond differently than they did before. An example of this includes galena dissolving and later becoming part of wulfenite.
- When the water cools, the substances can crystallize. Crystallization is the process in which the molecules of minerals bond to form crystals.

Crystallization through the cooling of molten rock

- Many minerals form from magma—molten rock found within the earth. Magma contains all the types of atoms that are found in minerals.
- As the magma cools, the atoms in it begin to bond to form minerals.
- The same process occurs for lava—molten rock that has reached earth's surface. However, the types and sizes of minerals formed from lava and magma differ.
- Quartz is a well known example of a mineral forming through this process.

Re-crystallization through heat and pressure

- Heat and pressure within Earth cause new minerals to form as bonds between atoms break and join again.
- Examples: garnet forms when it replaces the minerals chlorite and quartz as their atoms combine in new ways. If carbon is found in a rock, heat and pressure can change it to form graphite.

Organism producing minerals (biomineralisation)

- Some organisms are able to produce minerals. Geologists still consider these minerals.
- Ocean animals such as oysters, collect calcite from the water and use it form their shells. Humans are able to produce apatite for their teeth.