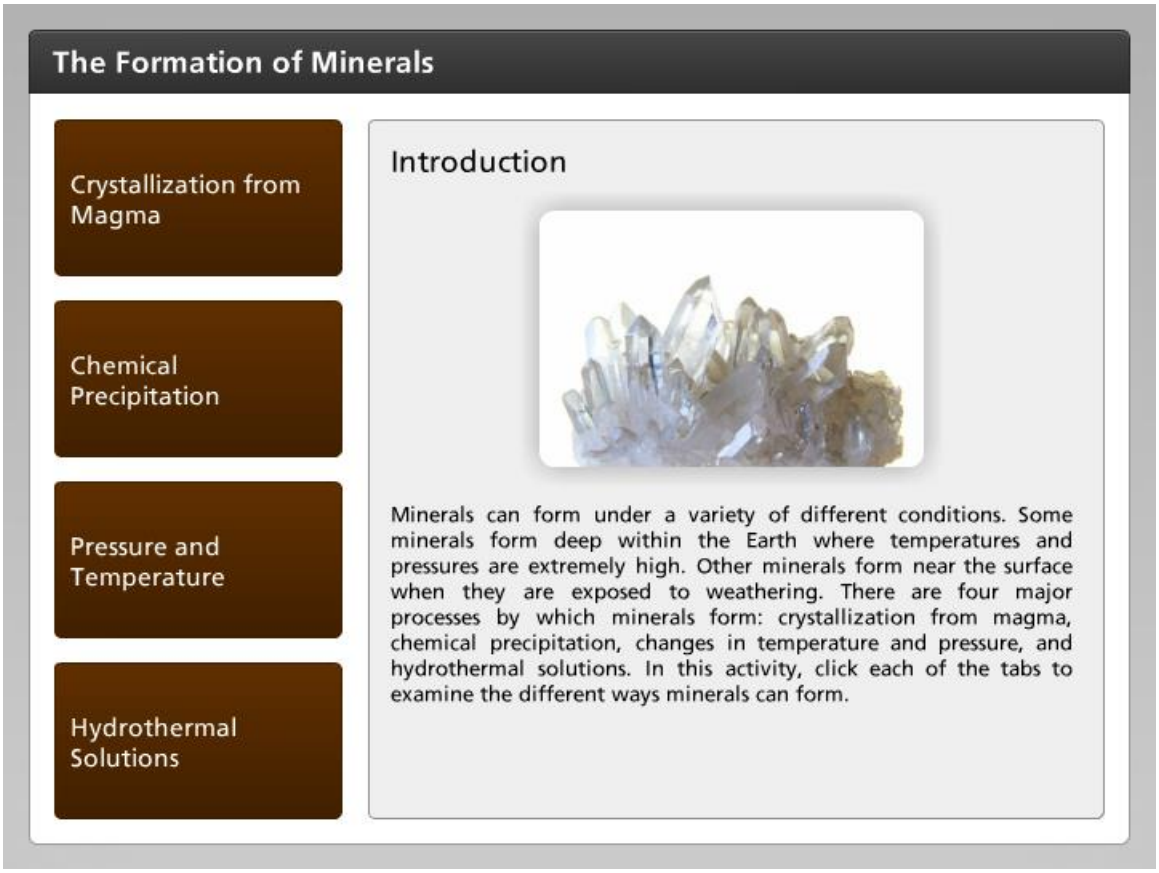
Module 5: Minerals
Topic 2 Content: The Formation of Minerals Notes

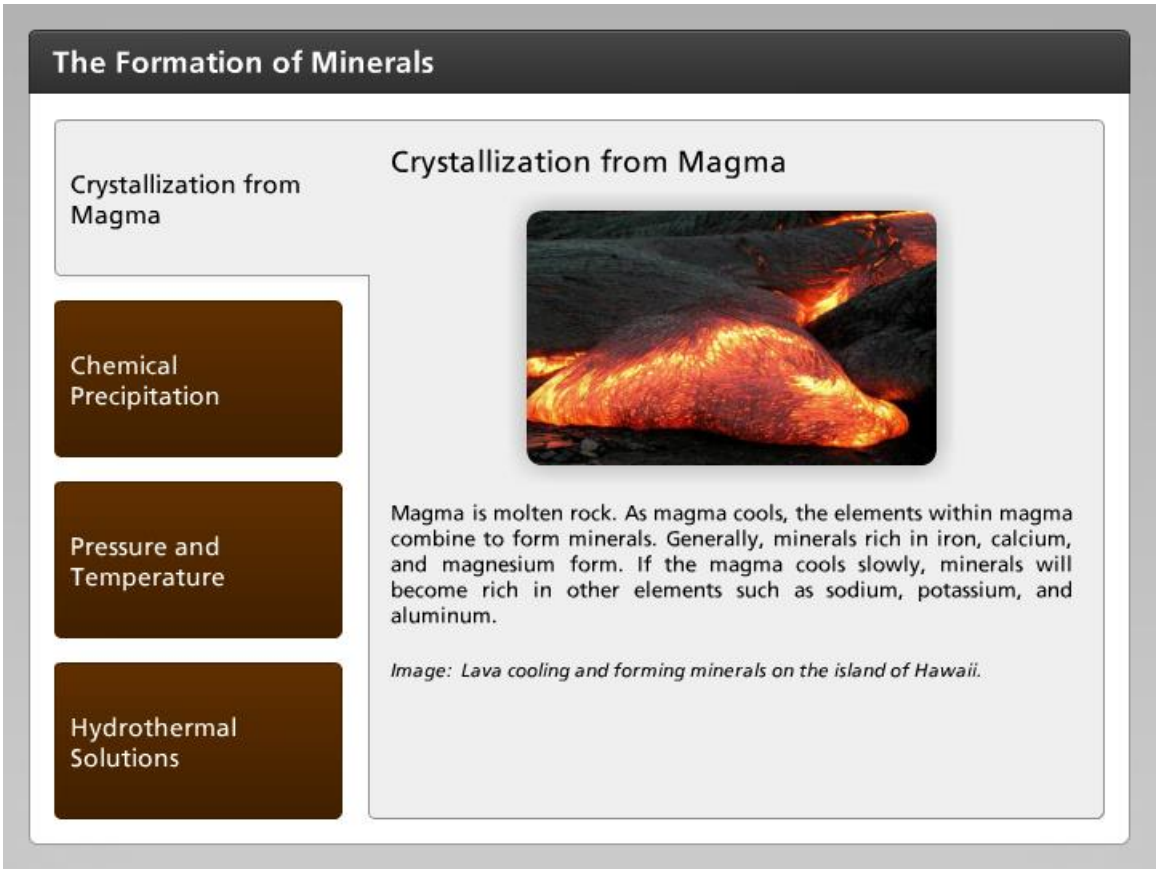
Introduction



Minerals can form under a variety of different conditions. Some minerals form deep within the Earth where temperatures and pressures are extremely high. Other minerals form near the surface when they are exposed to weathering. There are four major processes by which minerals form: crystallization from magma, chemical precipitation, changes in temperature and pressure, and hydrothermal solutions. In this activity, click on each of the tabs to examine the different ways minerals can form.

Module 5: Minerals
Topic 2 Content: The Formation of Minerals Notes

Crystallization from Magma

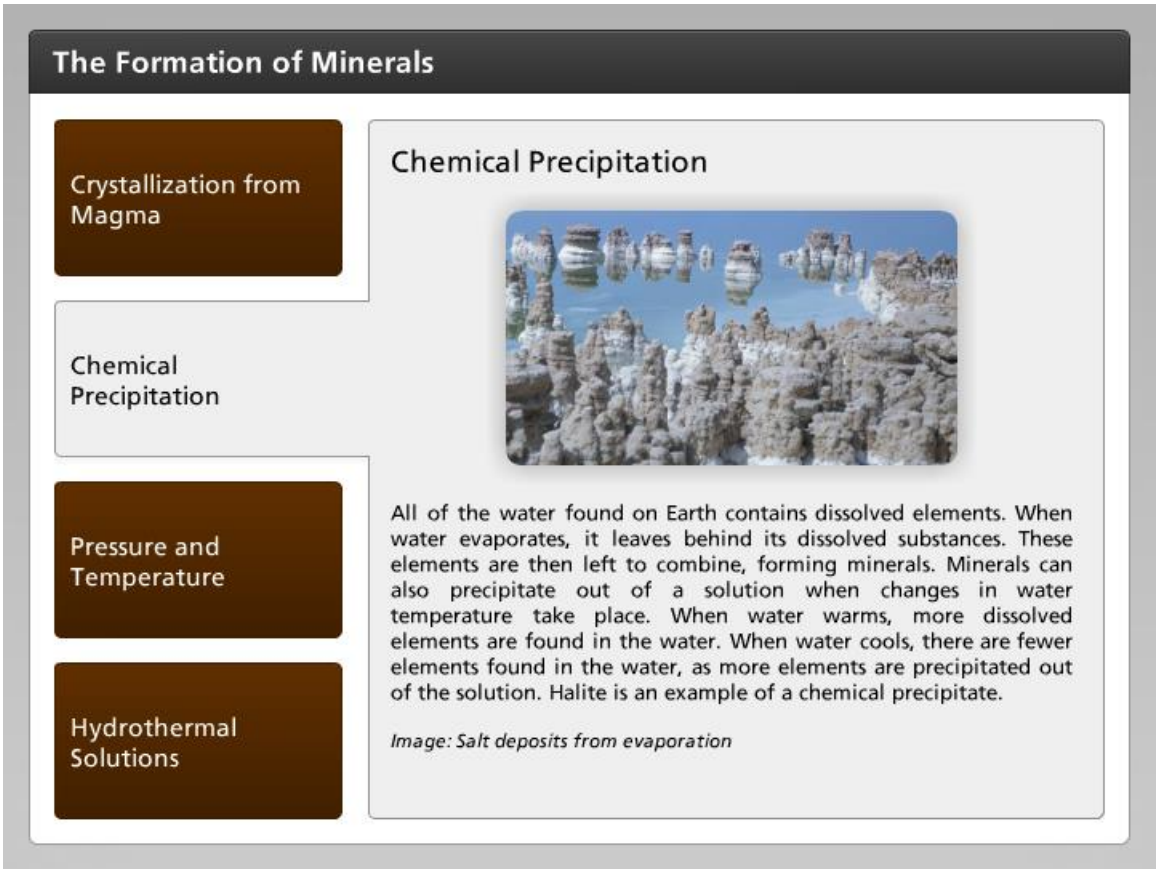


Magma is molten rock. As magma cools, the elements within magma combine to form minerals. Generally, minerals rich in iron, calcium, and magnesium form. If the magma cools slowly, minerals will become rich in other elements such as sodium, potassium, and aluminum.

Image: Lava cooling and forming minerals on the island of Hawaii.

Module 5: Minerals
Topic 2 Content: The Formation of Minerals Notes

Chemical Precipitation

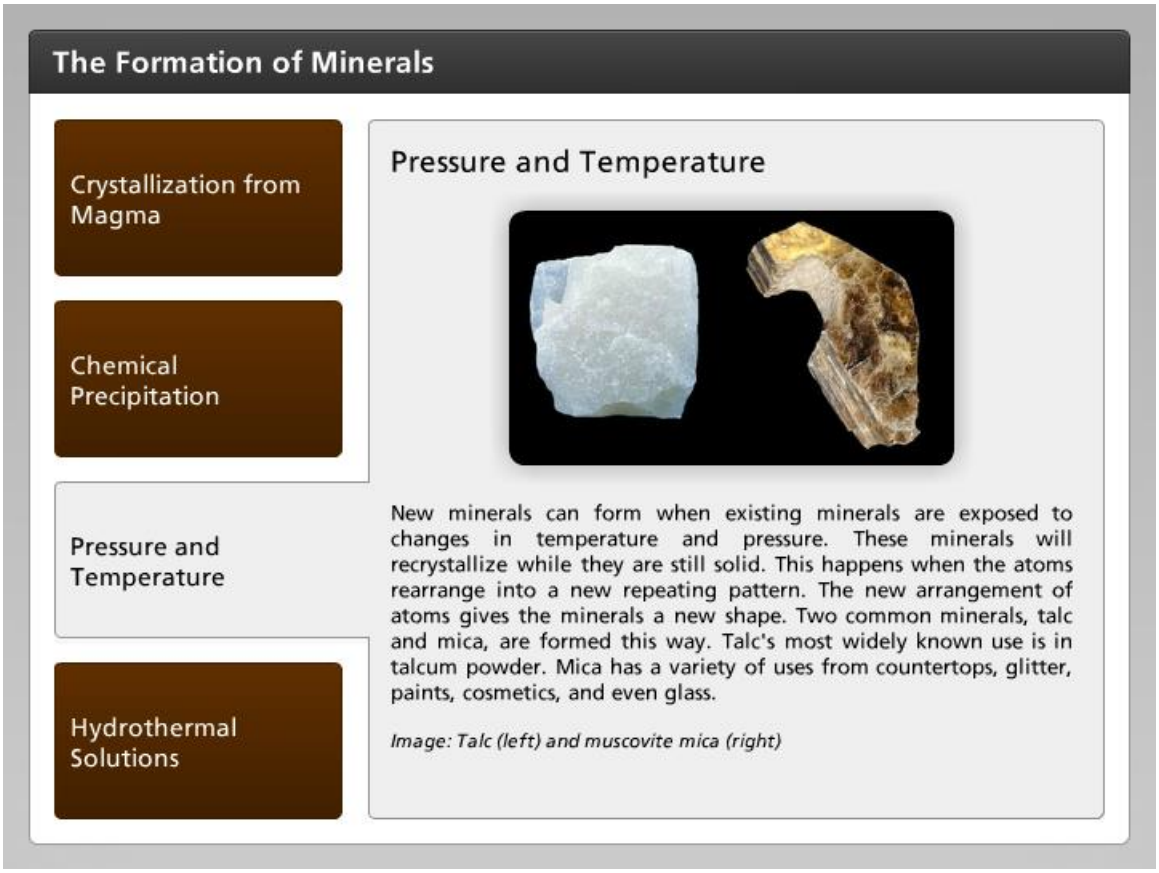


All of the water found on Earth contains dissolved elements. When water evaporates, it leaves behind its dissolved substances. These elements are then left to combine, forming minerals. Minerals can also precipitate out of a solution when changes in water temperature take place. When water warms, more dissolved elements are found in the water. When water cools, there are fewer elements found in the water, as more elements are precipitated out of the solution. Halite is an example of a chemical precipitate.

Image: Salt deposits from evaporation

Module 5: Minerals
Topic 2 Content: The Formation of Minerals Notes

Pressure and Temperature

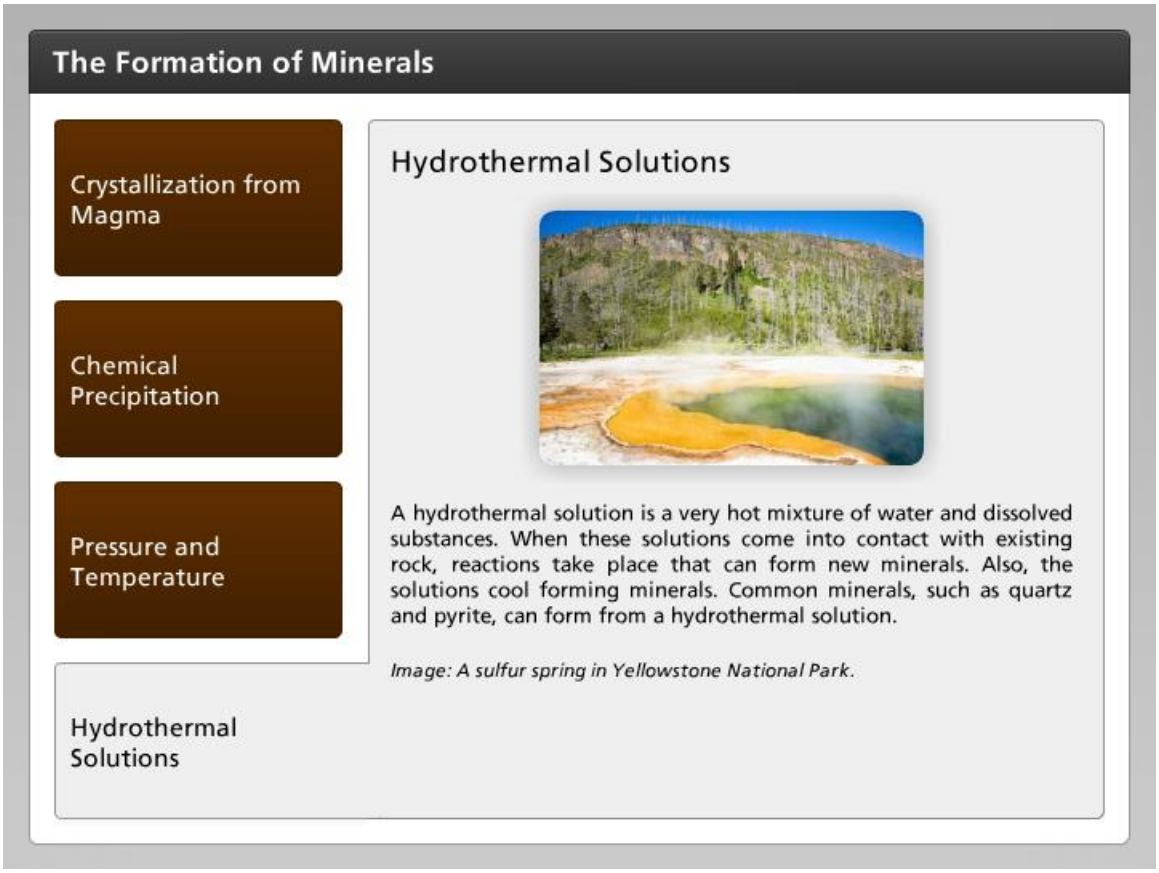


New minerals can form when existing minerals are exposed to changes in temperature and pressure. These minerals will recrystallize while they are still solid. This happens when the atoms rearrange into a new repeating pattern. The new arrangement of atoms gives the minerals a new shape. Two common minerals, talc and mica, are formed this way. Talc's most widely known use is in talcum powder. Mica has a variety of uses from countertops, glitter, paints, cosmetics, and even glass.

Image: Talc (left) and muscovite mica (right)

Module 5: Minerals
Topic 2 Content: The Formation of Minerals Notes

Hydrothermal Solutions



A hydrothermal solution is a very hot mixture of water and dissolved substances. When these solutions come into contact with existing rock, reactions take place that can form new minerals. Also, the solutions cool forming minerals. Common minerals, such as quartz and pyrite, can form from a hydrothermal solution.

Image: A sulfur spring in Yellowstone National Park.