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 crystallization of magma and lava. Minerals form as hot magma cools inside the crust, or as lava hardens on the surface. When these liquids cool to a solid state, they form crystals. The size of these crystals depends on several factors. The rate at which magma cools, the amount of gas magma contains, and the chemical composition of magma all affect crystal size. 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.

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.

Some minerals form from hot water solutions. When a hot water solution heated by magma deep underground begins to cool, the elements and compounds leave the solution and crystallize as minerals. 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.