

# MINERAL FORMATION



Minerals are forming all around us, as the result of predictable geologic environments. The physical and chemical conditions of those environments determine which minerals will form and can be classified into 4 main categories. **Igneous**, or magmatic environments, are where minerals crystallize from a melt. Minerals in **sedimentary** environments take their raw materials from rocks that have undergone weathering and erosion. **Metamorphic** environments create new minerals from old minerals, as the result of temperature and pressure changes on existing rock types. Finally, **hydrothermal** environments allow minerals to form by chemical precipitation, stemming from hot solutions below Earth's surface. These processes are often interconnected, so that minerals formed in one environment are crucial to the development of others elsewhere.

When we talk about minerals on Earth, we are generally referring to those formed in the crust. Earth's **crust** is comprised of about 90% **silicate minerals**, which form from the **silicon** and **oxygen** that is so abundant there. Other common elements, including **aluminum, magnesium, iron, calcium, sodium,** and **potassium**, also contribute to these silicate minerals. In contrast, we know less about the minerals in the Earth's mantle and core. **Olivine, spinel,** and **pyrope** (garnet) are often pushed up from the mantle due to volcanic activity, and geologists have speculated that Earth's solid core is actually one large **iron-nickel** crystal, with high concentrations of precious metals such as **gold** and **platinum**.



**Did you know?** Minerals don't always form perfectly! One common deformation is known as twinning. This is where two separate crystals share lattice points, causing intergrowth between them.



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## Grow your own crystals!

Crystal formation is guided by specific rules and variables. Magma isn't required, only the ability to generate the patterns of repeating molecules that give minerals their structure.



### OPTION 1

Stir together  $\frac{1}{2}$  cup of magnesium sulfate (Epsom salt) with  $\frac{1}{2}$  cup of hot water in a glass jar, until the solution is saturated and no more salt can dissolve. Stir in a few drops of food colouring, and then put your jar in the fridge. In a few hours, you should see fine crystals growing!

### OPTION 2

Build a "frame" for your crystals using a pipe cleaner. Make it whatever fun shape you like! Then, using some thread or fishing line, suspend the frame from a wooden popsicle or craft stick. Have an adult bring water to a boil on the stove, and let it cool slightly before (carefully!) pouring it into a standard sized glass jar. Add  $\frac{1}{2}$  a cup of borax and some food colouring, and stir until the borax is completely dissolved. If you used a bigger container, add enough borax to create a saturated solution. Then lay your popsicle stick across the jar, letting the frame hang submerged. In 24-48 hours, your crystals should be fully formed!

