

Igneous Rocks

Classification and Formation

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SUMMARY

Igneous rocks are one of three groups of rocks. Igneous rocks form from the cooling of molten rock (magma or lava). Igneous rocks are separated by their origin, texture, and mineral composition.

Igneous rocks are formed by molten rock.

- Igneous rocks form from molten rock. Molten rock is formed under earth's surface where temperatures ranging from 750-1250°C can melt rock.
- This type of molten rock is called **magma** because it is found inside earth.
- All igneous rocks are classified by their mineral composition, the size of its mineral crystals, and its origin.

Igneous rocks are classified by their origin.

- An igneous rock is classified differently depending on where it forms.
 - Igneous rocks that form when magma cools inside the earth are called **intrusive** (or plutonic).
 - Granite and gabbro are common intrusive igneous rocks.
 - Igneous rocks that form when lava cools on the earth's surface are called **extrusive**.
 - Rhyolite and basalt are common extrusive igneous rocks.

Igneous rocks are classified by their texture

- The texture of an igneous rock (the size of its crystals) depends on how quickly the molten rock that formed it cools. This results in four textures: coarse-grained, fine-grained, porphyritic, and glassy.
- **Coarse-Grained:** Magma forms intrusive rocks with large crystals.
 - The high temperature inside the earth allows magma to cool slowly.
 - Slow cooling allows for large, or **coarse-grained**, crystals to form.
 - Example: Granite
- **Fine-Grained:** Lava forms extrusive rocks with small crystals.
 - The low temperature on the surface the earth causes lava to cool quickly.
 - Fast cooling causes for small, or **fine-grained**, crystals to form.
 - Example: Rhyolite
- **Porphyritic:** Some igneous rocks form both large and small crystals.
 - The rock will first form from magma cooling slowly inside earth.
 - Large crystals form.
 - At some point, the rock is brought to the surface where it finishes cooling quickly.
 - Small crystals form around the large crystals.
 - The rock now has both large and small crystals, called a **porphyritic** texture.

- Example: Porphyry
- **Glassy (No Visible Grain)**: Some igneous rocks form no crystals
 - The lava on earth's surface cools so quickly, the atoms cannot crystallize.
 - The result is a smooth, glassy, shiny rock .
 - Example: Obsidian, Pumice

Igneous rocks are classified by their mineral composition

- Many igneous rocks have the same texture and origin. Therefore, it is necessary to observe the rock's mineral composition to separate them.
- Most igneous rocks are composed of silicate minerals. Silicate minerals contain amounts of **silica**, a compound of silicon and oxygen.
- Scientists measure the amount of silica in an igneous rock to classify it.
- You can estimate the amount of silica in a rock by its color.
 - Igneous rocks with high levels of silica are light in color. (Example: rhyolite)
 - Igneous rocks with low levels of silica are dark in color. (Example: basalt)

Igneous rocks are classified by all three characteristics

- As with minerals, we cannot classify an igneous rock solely by one characteristic (origin, mineral composition, or texture).
- Here's why. It is possible for two rocks to have the same (or similar) mineral composition. For example, granite and rhyolite have the same composition. However, they have different origins. The same is true of gabbro and basalt: same mineral composition, different origin.