

Igneous Rock

formed by cooling and solid cryst. of Magma.

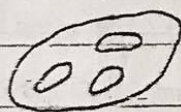
Magma: Molten Silicate minerals + ~~gasses~~ gasses
volatile mat. (water vapor + Carbon dioxide) ←

Cooling may occur under earth surface:

intrusive (plutonic) Ig. R.

or at earth surfaces Extrusive (volcanic) Ig. R.

Lava (molten silicate mineral) ← تطاير انطايرت من اذ magma



← يتكون نتيجة ذلك فجوات

"Vesicles" ← حويصلات أو اسطوانات تسمى gas bubbles

In crystallization process: magma moves freely and randomly

(spherical or elongated) on surface.

* Factors affecting crystallization:

① Mineral composition of magma.

② Amount of volatile mat. ← التي فيها مادة مواد تطايرت أكثر ← فجوات أكثر

③ Rate of cooling: ← سرعة التبريد

a) slow: under earth surface → large (coarse) crystal
Ex. Granite

b) rapidly (fast/quickly): at earth surface
"small fine crystal"

c) quenched (suddenly) & No crystal (glassy)
Ex. Obsidian. ← تبريد مفاجئ

البنية النارية (البنية البازلتية)
Texture of Ig. R. : البنية النارية البازلتية

Texture: The appearance of the Rock based on the size and arrangement of its crystal.

phanitic: fine-grained Rock → على تبريد سريع
Ex. Rhyolite, Basalt. على سطح الأرض - تبريد نوعي بالبرودة

phanitic: Ig. R. formed below the surface, it has coarse-grained texture → على تبريد بطيء
Ex. Granite. - تناف بالعمق

Porphyritic: if magma cool at diff. rate, so large crystal (phenocrysts) are formed and embedded in a matrix of small crystal (ground mass)
Ex. Andesite.



glassy: if magma is cooled suddenly, there is no time for ion to form orderly crystalline structure. Ex. Obsidian

Pyroclastic R: form from consolidation of Rock fragments ejected during violent eruption. their texture is similar to that of Sedi. R.

∴ texture depend on Rate of cooling.

Mineral Composition:

Depend on chemical composition of magma and environment of crystallization.

* **Basaltic R:** (mafic) contain high iron, magnesium, calcium and low in silicon.

They are darker and denser than other rocks.

Ex. **Basalt:** very dark green to black fine-grained volcanic rock, composed primarily of pyroxene and calcium feldspar with little amount of olivine and amphibole, "most common ext. Ig. R."

Gabbro: intrusive (coarse-grained) equivalent of basalt in colour and composition.

* **Granitic R:** (felsic) rich in potassium feldspar & Quartz

Ex. **Granite:** best known of all Ig. R. why?

Because it is natural beauty and it is abundance.

→ composed of (25-35%) quartz and >50% of potassium feldspar.

Rhyolite: volcanic (fine) rock equivalent to granite.

→ has aphanitic text.

* contain glassy fragments and voids which indicate rapid cooling.

Obsidian: * dark-coloured * Glassy R
* formed when lava cooled quickly
* contain high silica content.

pumice: * volcanic R. * Glassy text. * Gray colour
* formed when large quantity of gass escape through
Lava.

Intermediate
* Andesitic R: mineral make up is between
Granite and Basalt.

Ex. Andesite: vol. R. of medium gray colour
Fine-grained R, usually has a porphyritic text.

Diorite: coarse-grained intrusive R
* Like granite but differ by the absence of
visible quartz crystals.
* made up of Sodium plagioclase & amphibole.

* Ultramafic R: composed entirely of ferro-mg.
minerals

Ex. peridotite: it is major constituents of the
upper mantle → main mineral: olivine.

* Pyroclastic R: formed from fragments ejected during
volcanic eruption.

Ex. Tuff: composed of ash-size fragments then cementing
together.

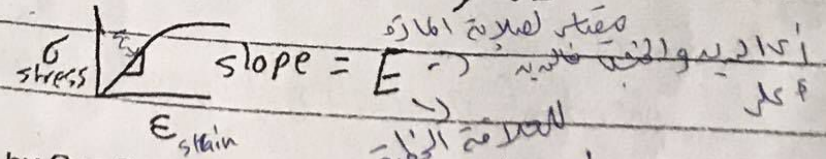
Vol. Breccia: * pyroclastic R
* composed of particles larger than ash.

اللايتيز (الزيتون) كازون

* pegmatites: it is a rocks composed of crystals of several centimeters even to few meters
 → due to crystallization in a fluid environment which increase the possibility of ions to migrate and form crystals.
 * Most of pegmatites are granitic in composition.

Physical and chem. properties ig. R
~~chem.~~ mech.

Prop.	Value
* G.S	≈ 3
* unit weight (γ)	28 kN/m^3
* Absorption (%)	< 1
* Coeff. of permeability (K)	$1 \times 10^{-5} \text{ cm/sec}$
* Compressive strength	$(100 - 300) \text{ N/mm}^2$
* Tension strength	$(7 - 30) \text{ N/mm}^2$
* Poisson's ratio (μ) = $\frac{\epsilon_h}{\epsilon_L}$	$(0.25 - 0.33)$
* Sonic velocity	$(3000 - 6500) \text{ m/s}$
* Modulus of Elasticity (E)	$> 8000 \text{ N/mm}^2$



مقدار استطالة المادة
 الزيادة في الطول
 النسبة المئوية للتغير في
 الطول
 E strain
 stress