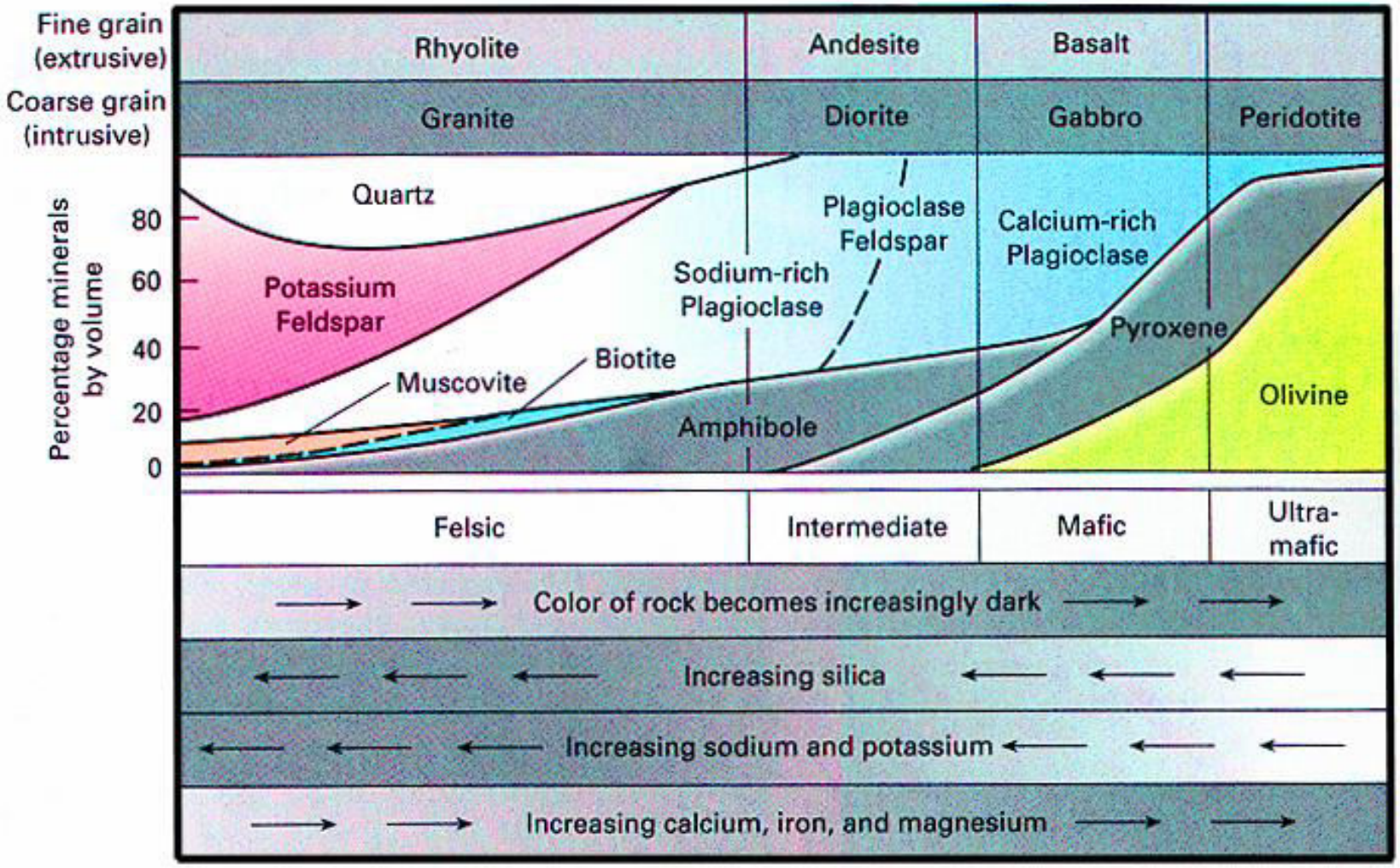
Igneous rock names

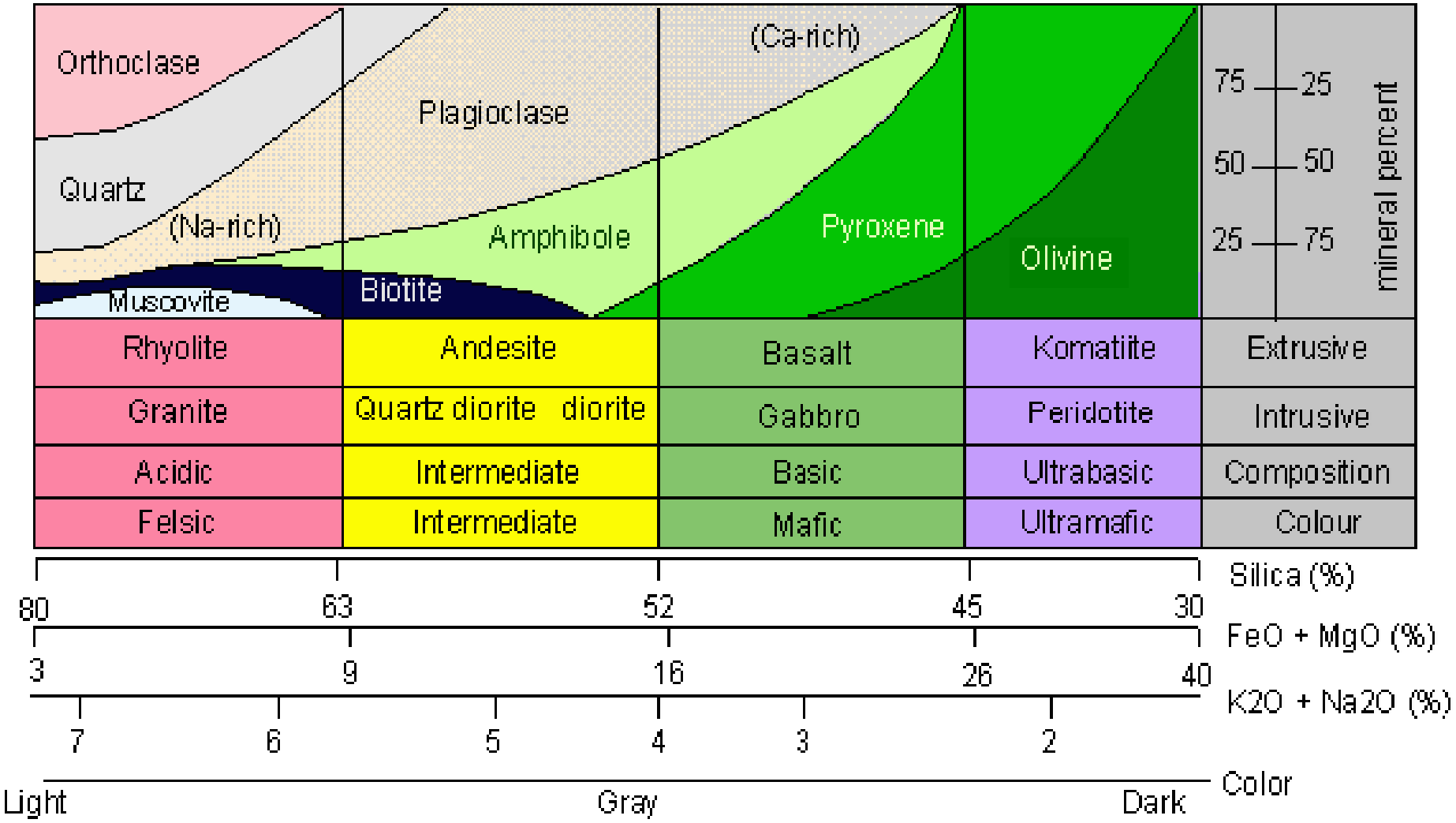
- determined by texture
  - size and arrangement of mineral grains
- *AND* by mineral composition
  - minerals affect rock color and indicate temperature of creation



Texture

The texture of a rock is the size, shape, and arrangement of and the relationships between neighboring grains or crystals.

Classification of Igneous rocks



Types of Igneous textures

- **Types of igneous textures**
  - **Aphanitic (fine-grained) texture**
    - **Rapid rate of cooling of lava or magma**
    - **Microscopic crystals**
    - **May contain vesicles (holes from gas bubbles)**
  - **Phaneritic (coarse-grained) texture**
    - **Slow cooling**
    - **Crystals can be identified without a microscope**

Categories of Igneous rocks

Intrusive or Plutonic rocks

- cool beneath Earth's surface
- cool very slowly
- higher P & T
  - Phaneritic textures

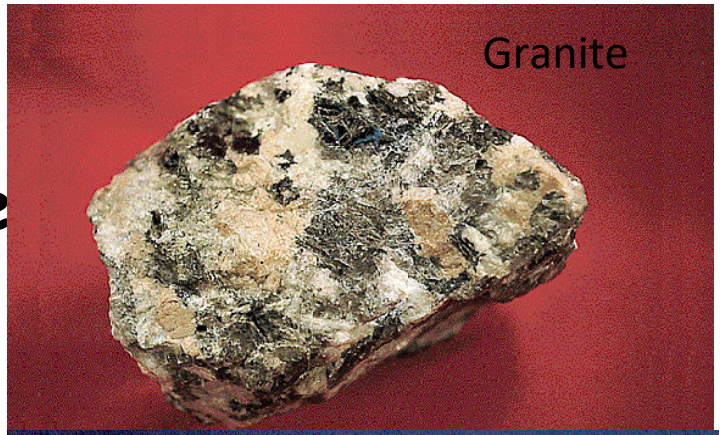
Extrusive or volcanic rocks

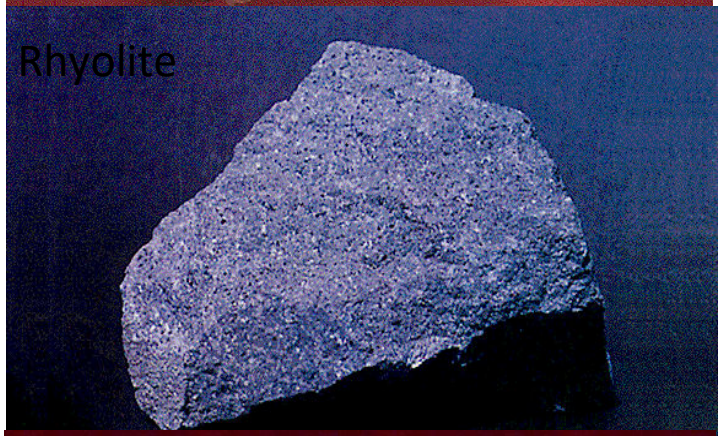
- cool on the Earth's Surface
- cool relatively fast
- lower T & P
  - Aphanitic textures
  - Pyroclastic textures

Complex

Partially cools below and above

- Porphyritic textures



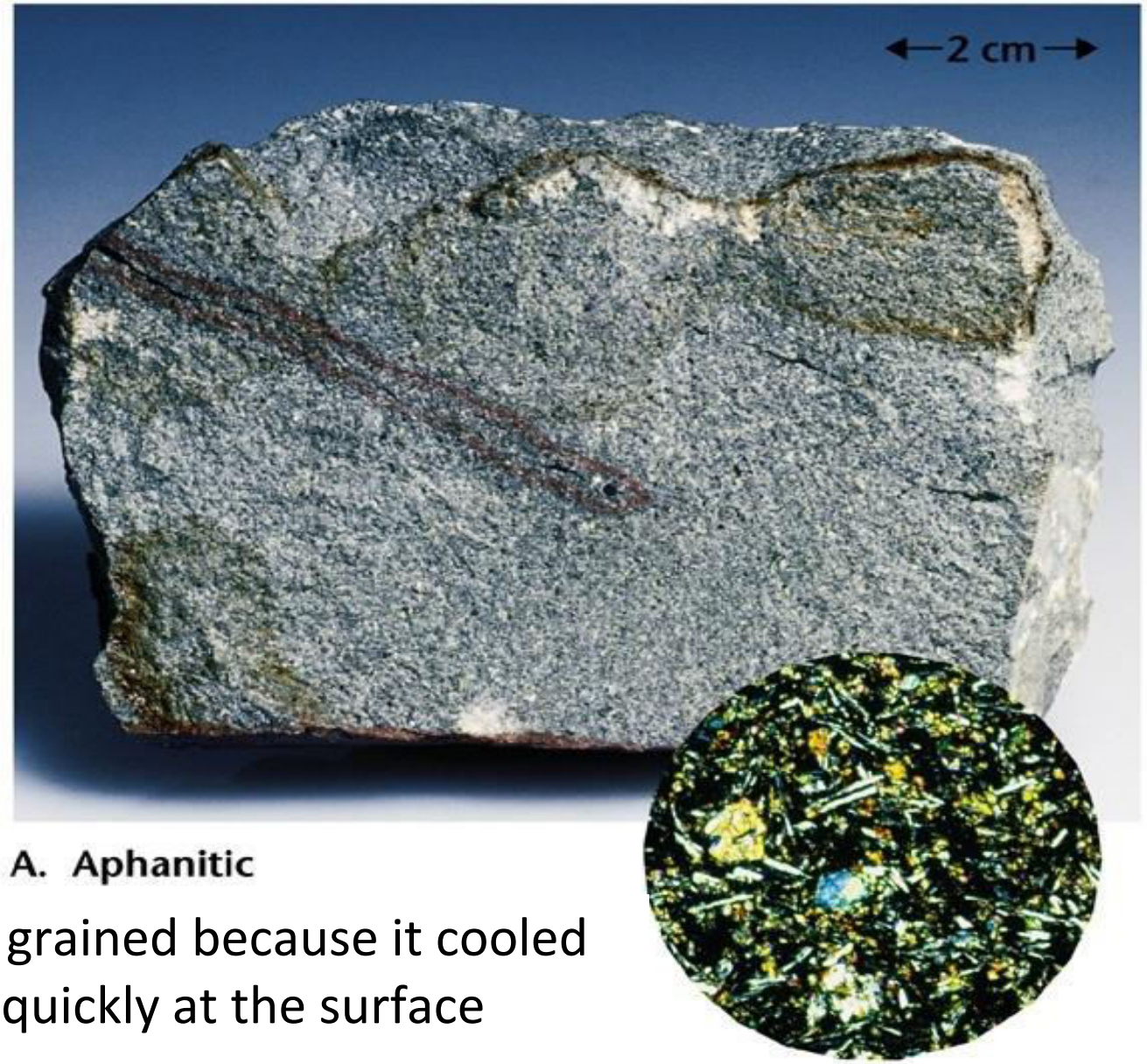


Texture

- Igneous minerals vary greatly in grain size.
- Phenocrysts are grains in an igneous rock that are larger than the other grains that make up the rest of the rock.

Grain Size Categories		Grain Size Divisions
fine grained	=	< 1 mm
medium grained	=	1 mm < 5 mm
coarse grained	=	5 mm < 3 cm
very coarse-grained	=	≥ 3 cm

Aphanitic texture



A. Aphanitic

Fine grained because it cooled quickly at the surface

Aphanitic Texture

- Aphanitic (Extrusive)
  - Very fine-grained and contain crystals that are too small to distinguish without the aid of a magnifying lens.
  - May also contain vesicles of remnant gas that give the rock a vesicular texture. Vesicles form when the rock cools very quickly and preserves the openings formed by the expansion of trapped gas bubbles.

Vesicles

Amygdales

Amygdaloidal basalt

Magmas generally contain dissolved gas, which can form bubbles in the magma as the pressure is released on eruption. These bubbles can get trapped in the solidified rock. After some time, groundwater or hot solutions connected with the volcanic activity pass through the porous lava and deposit crystals in the open cavities, which gradually fill up with quartz, calcite or other minerals. Filled cavities in lavas are called *amygdales*, and a rock full of them can be called *amygdaloidal*.

Phaneritic texture

B.

Coarse crystals cooled slowly at great depth

Intrusive Igneous Rock (Granite) – This granite cooled 30 kilometers under the surface

Igneous textures

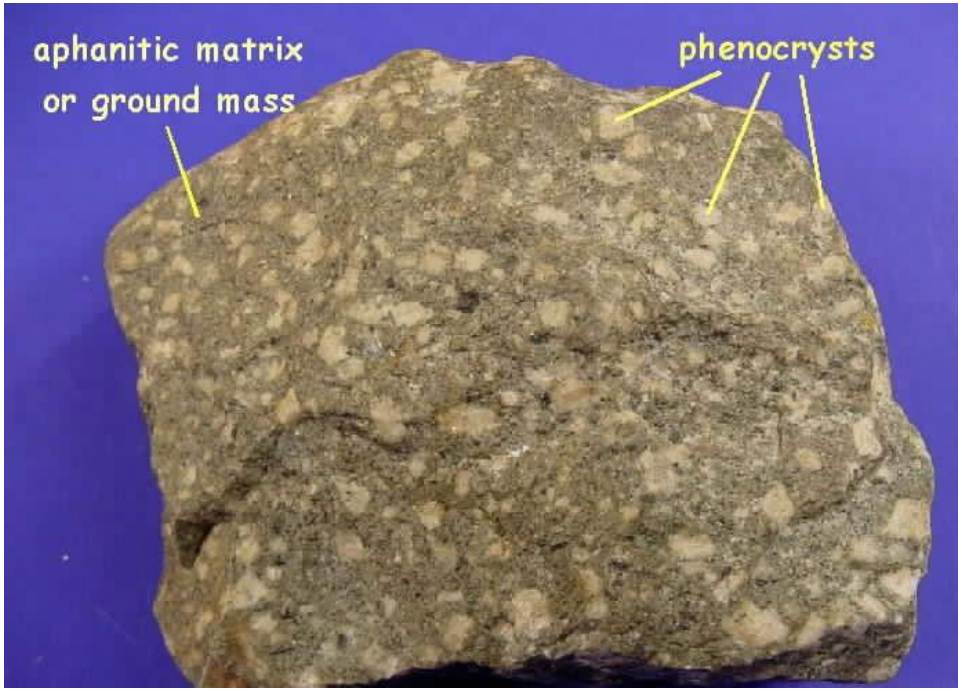
- **Types of igneous textures**
  - **Porphyritic texture**
    - **Minerals form at different temperatures as well as differing rates**
    - **Large crystals, called phenocrysts, are embedded in a matrix of smaller crystals, called the groundmass**
  - **Glassy texture**
    - **Very rapid cooling of molten rock**
    - **Resulting rock is called obsidian**

Porphyritic texture

C. Porphyritic

Granite

Two-stage cooling?


aphanitic matrix
or ground mass
phenocrysts

Glassy texture

Fast cooling

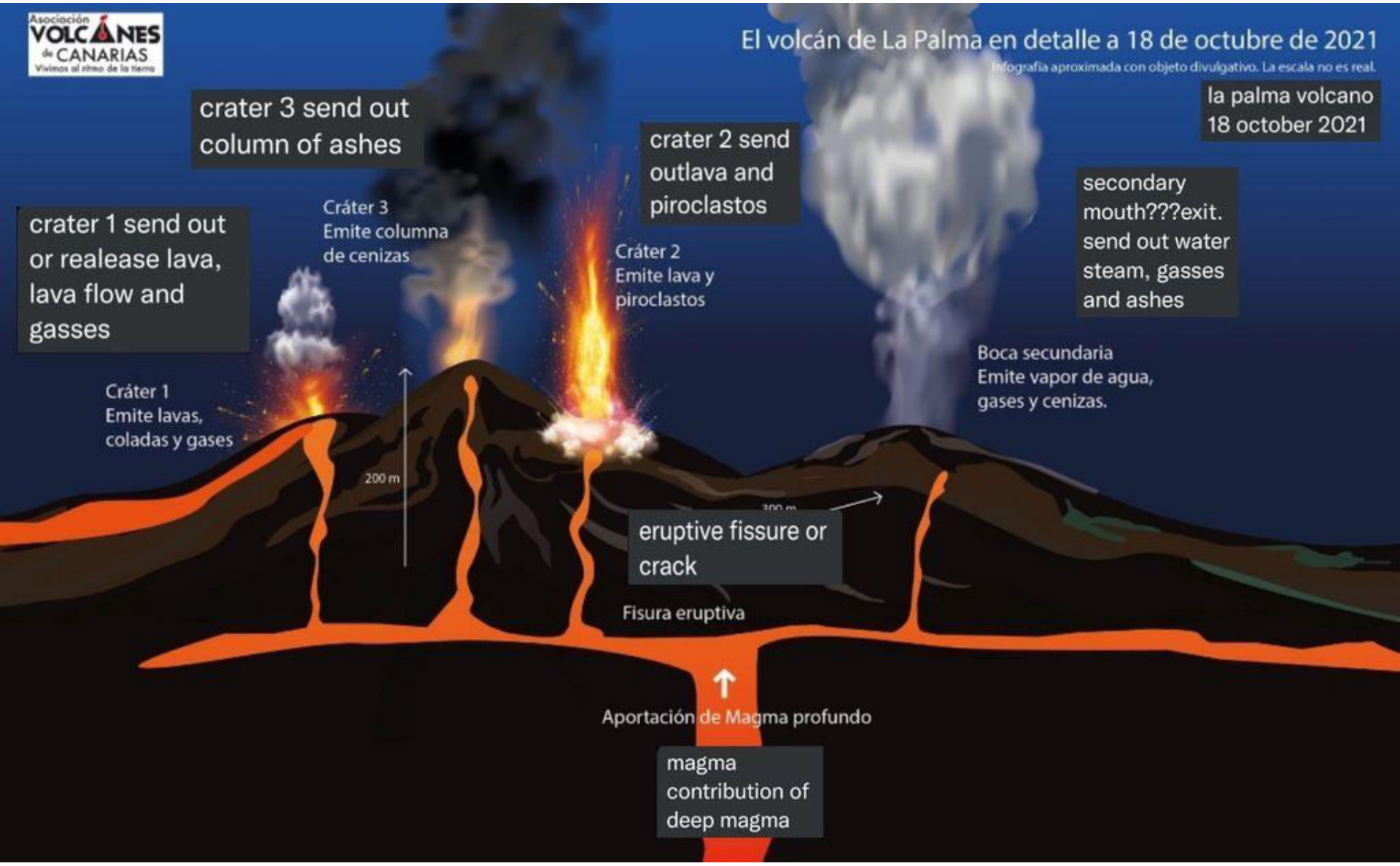
Obsidian

Magmas that cool rapidly, or that were erupted at relatively low temperatures, may not be able to form crystals before they solidify, and so remain in the form of a silicate glass.

More types of Igneous textures

- **Types of igneous textures**
  - **Pyroclastic texture**
    - **Various fragments ejected during a violent volcanic eruption**
    - **Textures often appear to more similar to sedimentary rocks**

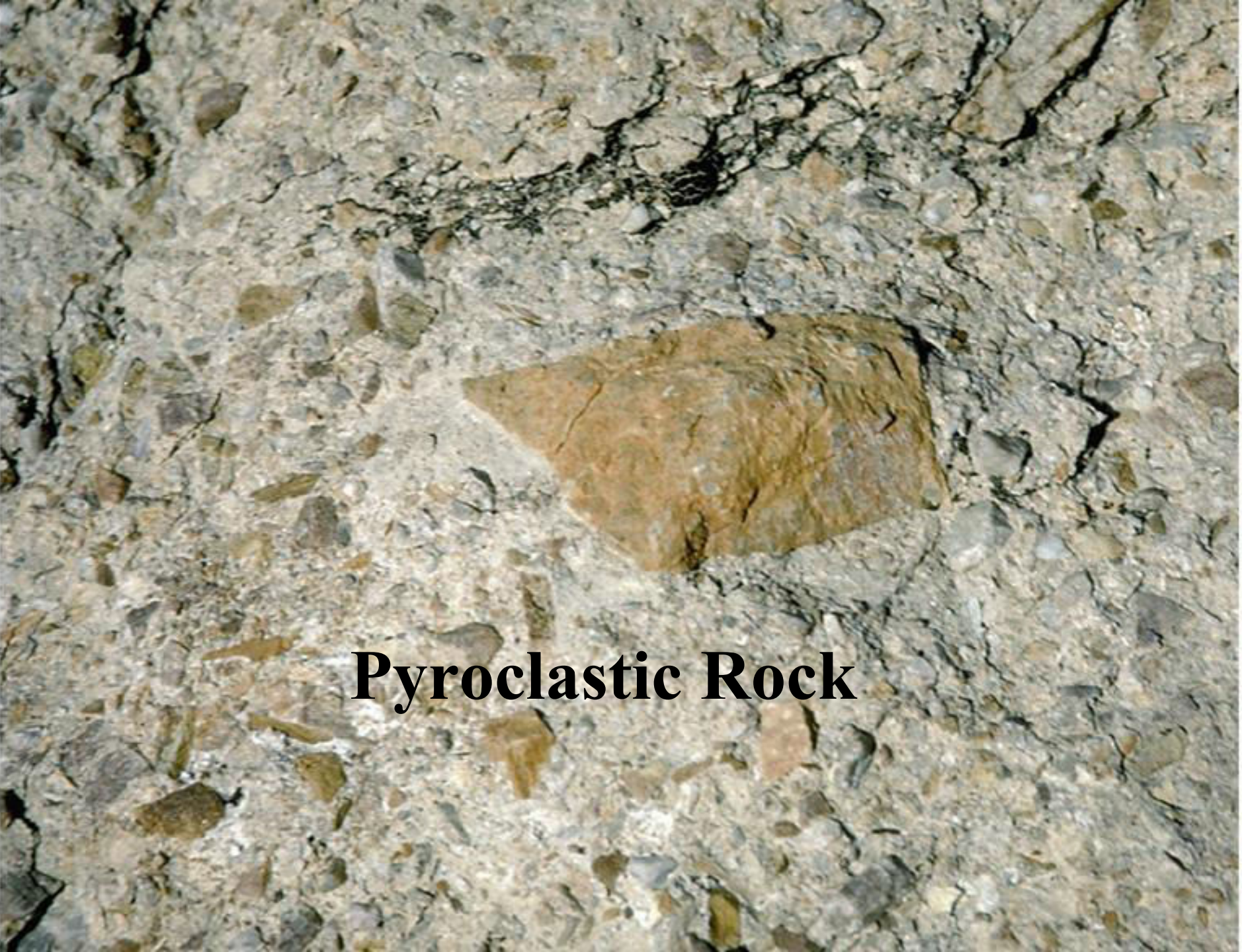
Nifty midcap +2.29%


Asociación VOLCANES de CANARIAS
Vivimos al ritmo de la tierra
El volcán de La Palma en detalle a 18 de octubre de 2021
Infografía aproximada con objeto divulgativo. La escala no es real.
la palma volcano 18 october 2021
crater 3 send out column of ashes
crater 2 send outlava and piroclastos
secondary mouth???exit. send out water steam, gasses and ashes
crater 1 send out or realease lava, lava flow and gasses
Cráter 3
Emite columna de cenizas
Cráter 2
Emite lava y piroclastos
Boca secundaria
Emite vapor de agua, gases y cenizas.
Cráter 1
Emite lavas, coladas y gases
200 m
eruptive fissure or crack
Fisura eruptiva
Aportación de Magma profundo
magma contribution of deep magma

Spain: La Palma volcanic eruption intensifies, engulfs more homes

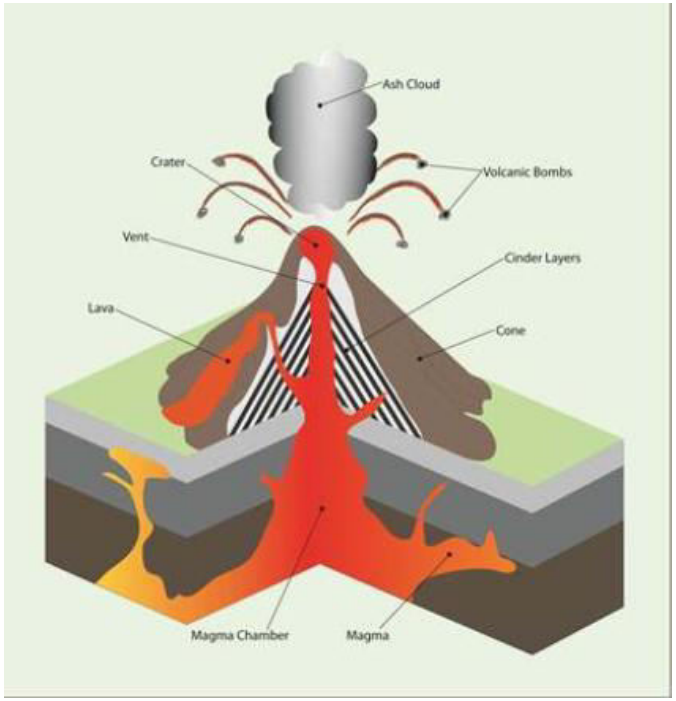
Volcano that began erupting on September 19 has destroyed more than 800 buildings, forced evacuation of about 6,000 people.

La Palma


Pyroclastic Rock

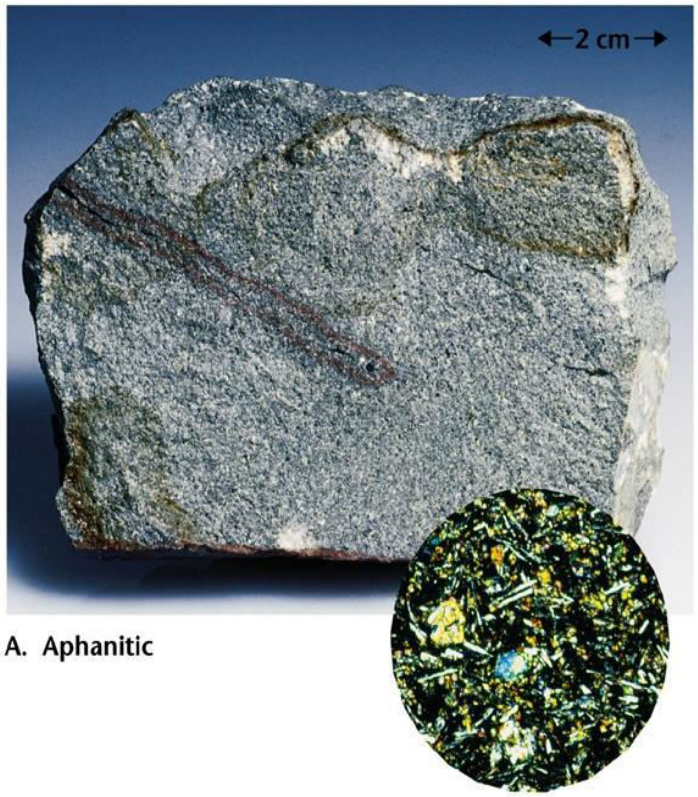
Pumice is a light-colored, extremely porous igneous rock that forms during explosive volcanic eruptions

Agglomerate or
Volcanic breccia


Ash Cloud
Crater
Volcanic Bombs
Vent
Cinder Layers
Lava
Cone
Magma Chamber
Magma

Igneous compositions

- **Naming igneous rocks – basaltic (mafic) rocks: Fine-grained**
  - **Basalt**
    - **Volcanic origin**
    - **Aphanitic texture**



A. Aphanitic

    - **Composed mainly of pyroxene, some olivine and also calcium-rich plagioclase feldspar**
    - **Most common extrusive igneous rock**

Gabbro

Igneous compositions

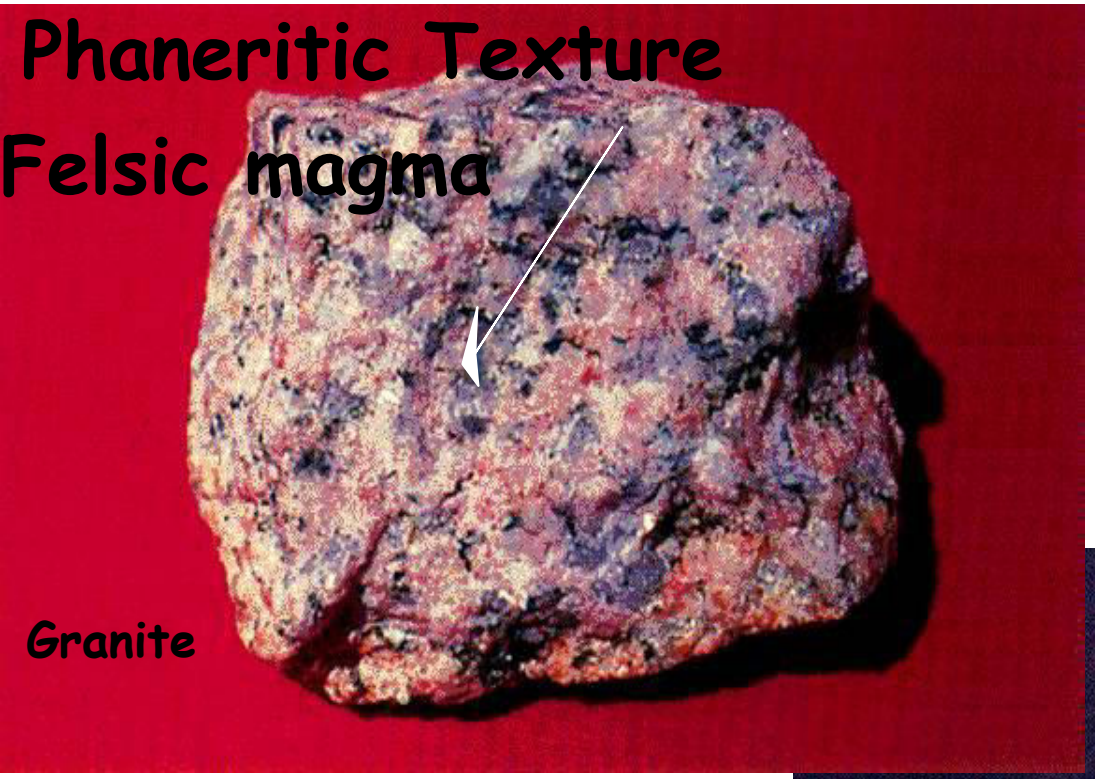
Diorite

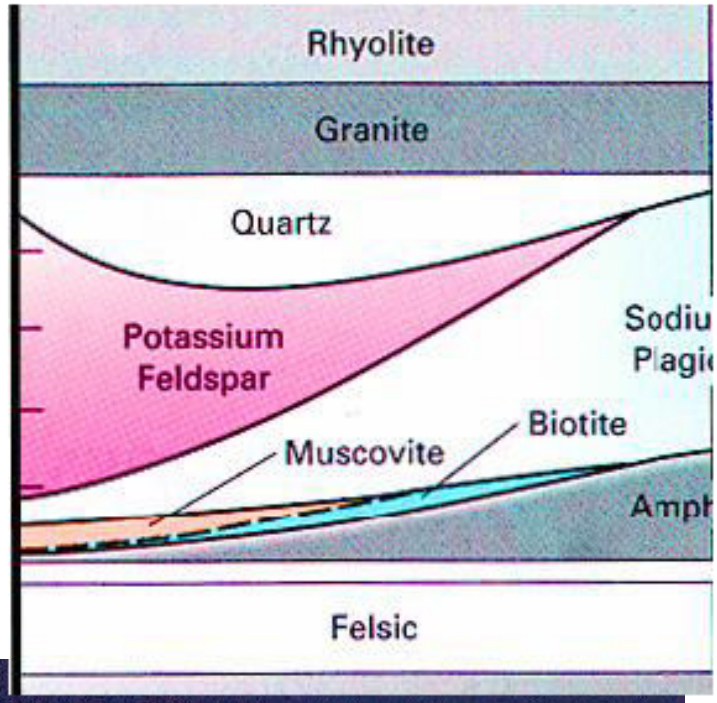
Close up

- **Intermediate rocks**
  - **Diorite**
    - **Plutonic equivalent of andesite**
    - **Coarse grained**
    - **Intrusive**
    - **Composed mainly of intermediate feldspar and amphibole**

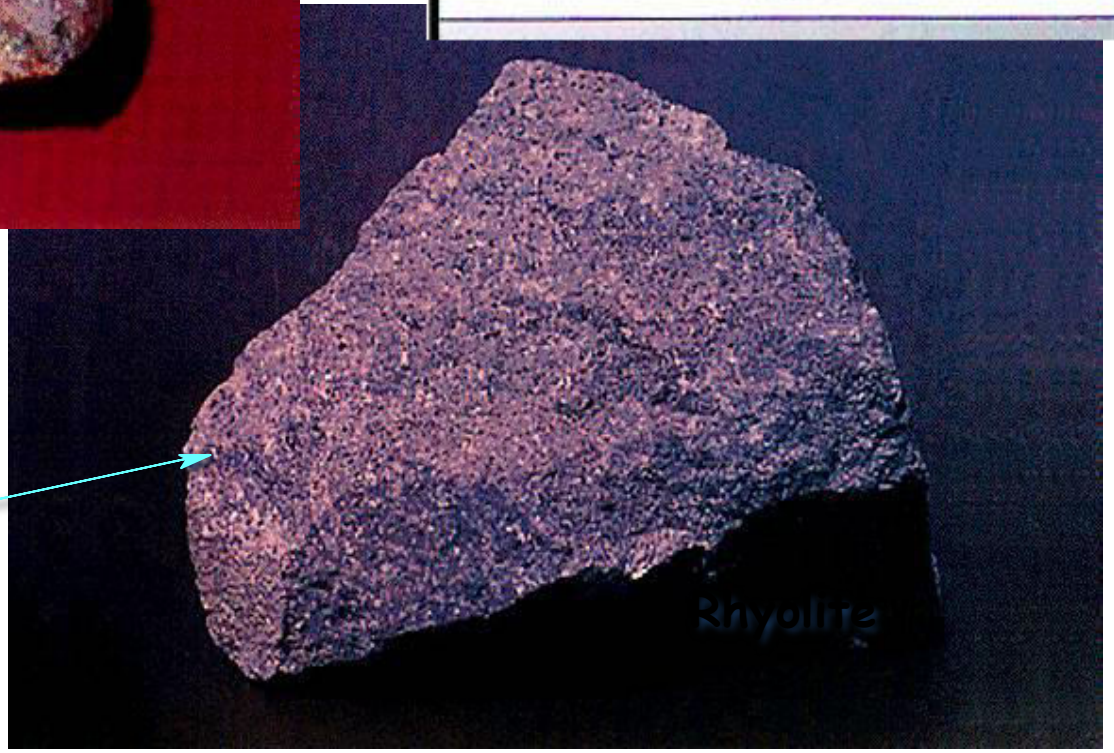
Pavlof and Pavlof Andesite Volcanos, most active volcanoes in Alaska.

Granite & Rhyolite





Aphanitic Texture
Felsic magma

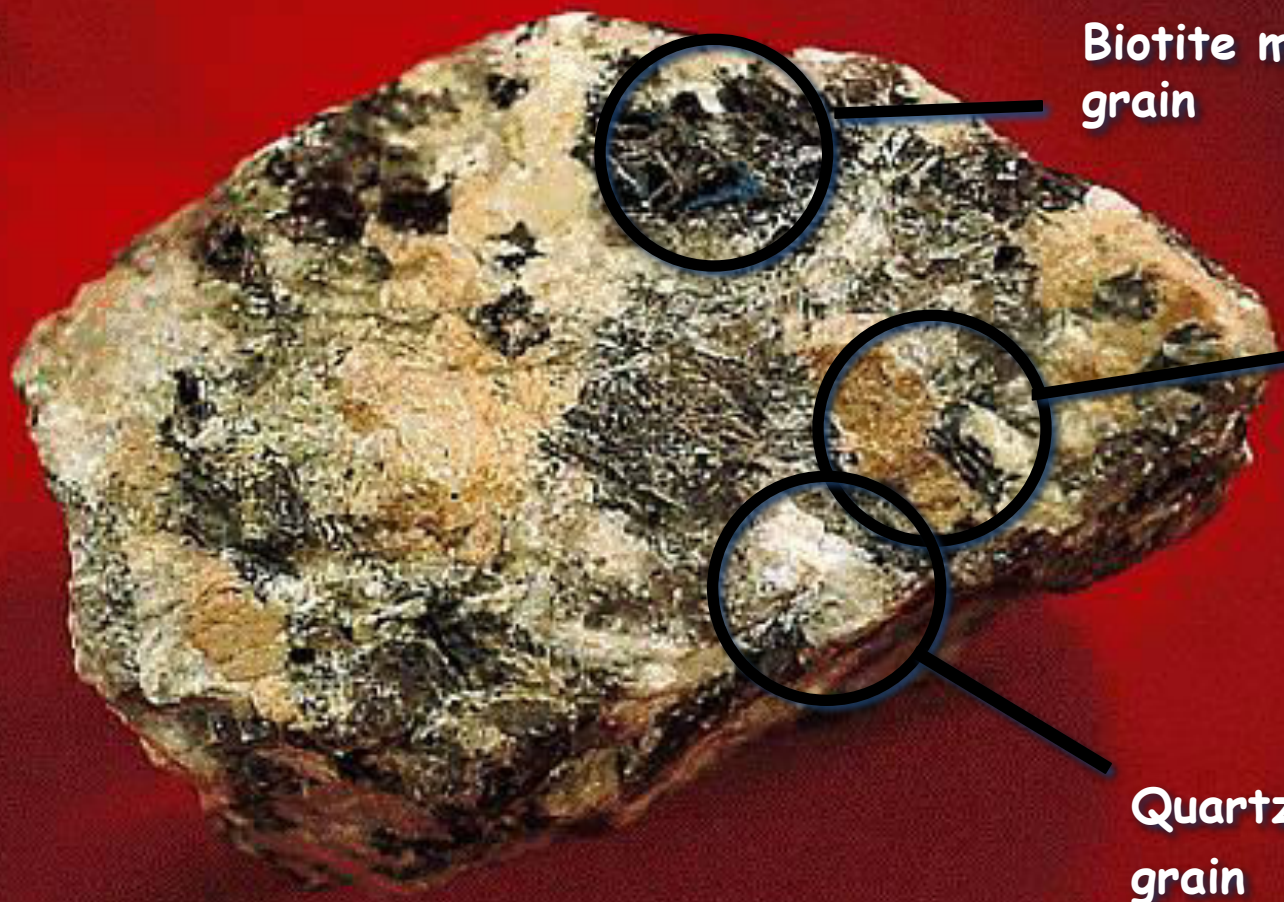


Pegmatite

A Pegmatite is a very coarse-grained igneous rock.

Crystals are >2 cm, often larger.

Most are granitic, although mafic pegmatites can form.



Tourmaline pegmatite. Tourmaline is black, white is plagioclase, gray is quartz. Haapaluoma, Finland. Width of sample 15 cm.

A pegmatite is a holocrystalline intrusive igneous rock composed of interlocking phaneritic crystals usually larger than 2.5cm in size. Pegmatites form during the final stage of a magma's crystallization. They contain exceptionally large crystals and sometimes contain minerals that are rarely found in other types of rocks.

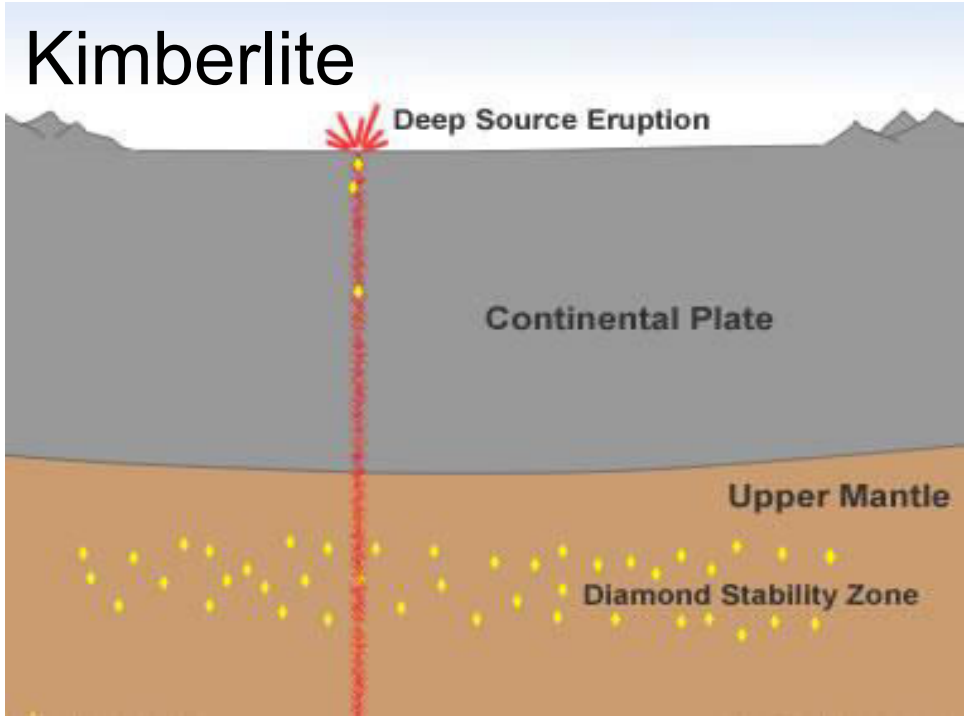

© www.pegmatite.ru

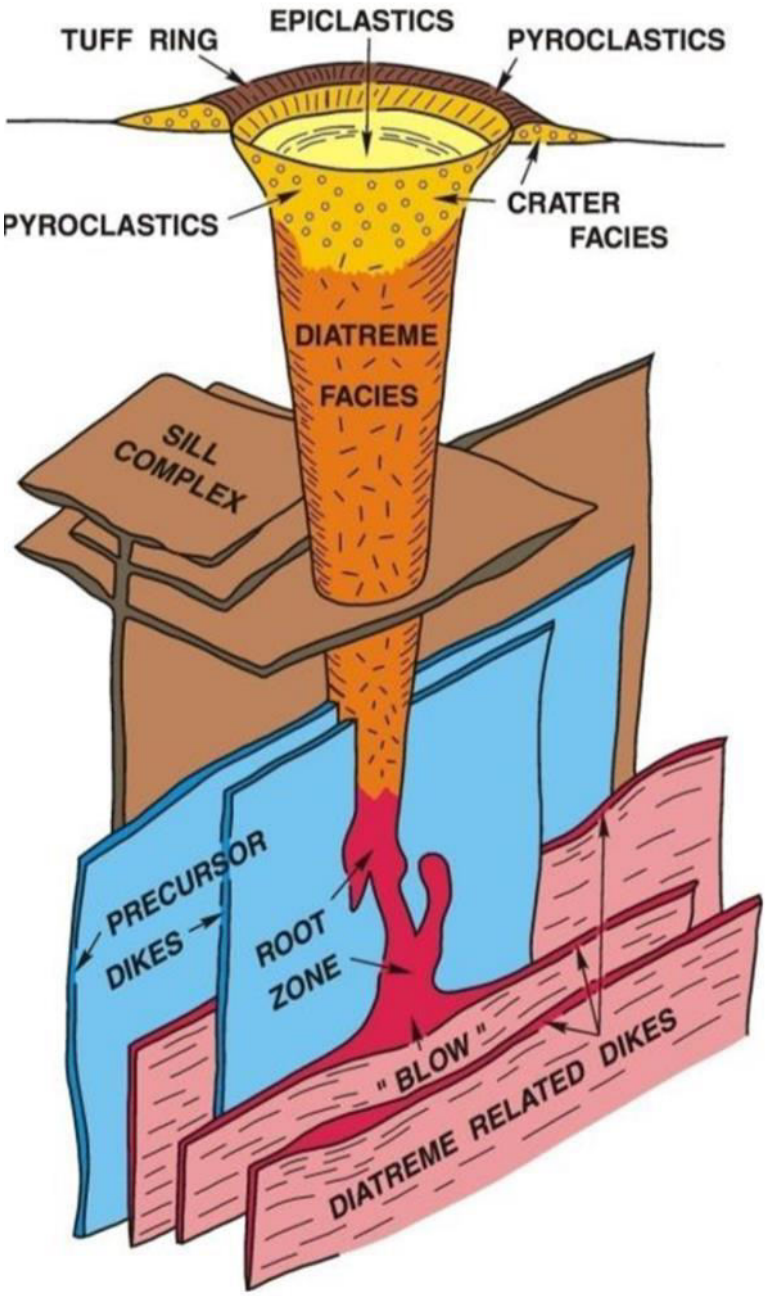
Dunite is an ultramafic plutonic rock that is composed almost exclusively of olivine. "Ultramafic" means that mafic minerals form more than 90% on the rocks composition

Dunite

Peridotite is a dense, coarse-grained igneous rock consisting mostly of the minerals olivine and pyroxene.

Kimberlite


Deep Source Eruption
Continental Plate
Upper Mantle
Diamond Stability Zone


TUFF RING
EPICLASTICS
PYROCLASTICS
PYROCLASTICS
CRATER FACIES
DIATREME FACIES
SILL COMPLEX
PRECURSOR DIKES
ROOT ZONE
" BLOW "
DIATREME RELATED DIKES

Points to study

1. Colour
2. Felsic, mafic or intermediate
3. Grain size – fine, medium, coarse, grain size range, equigranular, inequigranular
4. Minerals (quartz, K-feldspar, plagioclase, biotite, muscovite, hornblende, etc)
5. Shape of coarse mineral grains (tabular, needle shaped, equant, rounded, etc)
6. Texture – aphanitic, porphyritic, glassy, pegmatitic, pyroclastic, vesicular, amygdaloidal
7. Rock nomenclature
8. Cooling history, extrusive vs. intrusive, plutonic, hypabyssal or volcanic