

## TEXTURES OF THE IGNEOUS ROCKS\*

*Structure* - large-scale features recognizable in the field, such as banding, lineation, jointing, and vesicularity.

*Texture* - refers to degree of crystallinity, grain size, and geometrical relationships between the constituents of a rock (fabric).

### I. Igneous Textures

#### A. Degree of Crystallinity

*Holocrystalline* - composed wholly of crystals

*Hypocrystalline* - contains both glass and crystals

*Holohyaline* - consists entirely of glass

*Microlites* - minute incipient crystals which are birefringent

*Crystallites* - smaller than microlites, spherical, rod- and hair-like isotropic forms

#### B. Grain Size or Granularity

*Cryptocrystalline* - crystals cannot be distinguished even with a microscope

*Aphanitic* - crystals not visible to the unaided eye

*Phaneritic* - grains readily distinguished with the unaided eye

If the grains of the rock are roughly the same size:

Fine < 1 mm

Medium 1-5 mm

Coarse 5 mm-3 cm

Very coarse > 3 cm

#### C. Shape of Crystals

1. *Euhedral (idiomorphic)* - grains completely bounded by crystal faces

*Subhedral (hypidiomorphic)* - grains only partly bounded by crystal faces

*Anhedral (allogromorphic)* - grains completely devoid of crystal boundaries

2. Habit - columnar, acicular, fibrous, tabular, prismatic, equant, and flaky

3. Order of crystallization

a. When one mineral is surrounded by another, the enclosing mineral is younger.

b. Early crystals are generally euhedral or at least more nearly so than later crystals.

c. If both large and small crystals occur together, the large ones are those that began to develop first.

d. **There are numerous exception to these rules.**

D. Granular Texture - most of the minerals of a rock are approximately equidimensional or equant.

*Panidiomorphic-granular* (automorphic-granular) - the chief minerals are euhedral

*Hypidiomorphic-granular* (hypautomorphic-granular or *granitic*) - some constituents are euhedral, some subhedra, and the rest anhedral

Microgranitic - texture developed only on a microscopic scale

*Allotriomorphic-granular* (xenomorphic-granular or *aplitic* or sugary or *saccharoidal*) - almost all of the constituents are anhedral

#### E. Porphyritic Textures - notably inequigranular rocks

Megaphenocrysts - recognizable to unaided eye

Microphenocrysts - microscope is needed to recognize the phenocrysts. Texture is microporphyritic.

*Vitrophyric* - matrix is glass

*Felsophyric* - groundmass is a dense intergrowth of quartz and feldspar

*Glomeroporphyritic* - phenocrysts are gathered in distinct clusters

#### F. Textural Terms Related to Mineral Relationships

1. *Graphic* - quartz intergrown with alkali feldspar. Quartz appears as runic inscriptions on a background of feldspar.
2. *Myrmekitic* - minute worm-like or finger-like bodies of quartz enclosed in sodic plagioclase, usually oligoclase
3. *Ophitic* - feldspar laths largely or entirely enclosed in pyroxene  
*Subophitic* - average length of feldspar laths exceeds that of pyroxene grains, so the feldspar laths are only partly enclosed  
*Hyalophitic* - glass takes the place of pyroxene
4. *Poikilitic* - numerous grains of various minerals in random orientation are completely enclosed within large, optically continuous crystals of different composition
5. *Coronas* (reaction rims) - one mineral rims another  
*Kelyphitic* rims - concentric shells with a radial fibrous texture. Common in basic and ultrabasic rocks
6. *Intergranular* - angular interstices between the feldspars occupied by ferromagnesian granules  
*Intersertal* - interstices filled with glass, cryptocrystalline material, or non-granular deuteritic and secondary minerals  
*Hyalopilitic* - typical of many lavas in which glass occupies minute interspaces between microlites of feldspar in haphazard orientation
7. *Felted* - matrix composed of a crowded mass of microlites, generally of feldspar, interwoven in irregular fashion  
*Pilotaxitic (trachytic)* - crowded microlites of feldspar are disposed in a subparallel manner as a result of flow and their interstices are occupied by micro- or crypto-crystalline material
8. *Vesicles* - cavities formed by expanding gases. Usually spherical or ovoid, but many are highly irregular.  
*Amygdules* - filling of the cavities (vesicles) with deuteritic or secondary minerals
9. *Miarolitic cavities* - found in plutonic rocks - large subhedral and euhedral crystals projecting into irregular cavities
10. *Spherulites* - found in siliceous lavas and shallow intrusive rocks - radial aggregates of acicular and fibrous minerals  
*Varioles* - radial or sheaf-like bodies in basic rocks. Usually consist of divergent plagioclase fibers. The texture is called variolitic.  
*Bostonitic* - radial texture found in certain medium- and fine-grained dike rocks. Consists of irregular interlocking laths of alkali feldspar, arranged in crudely divergent groups.

11. *Ocellar* - phenocrysts in porphyritic rocks resemble eyes partly or wholly enveloped by tangentially or radially arranged crystals of later growth

G. Clastic Textures - the rock constituents have a fractured appearance

*Pyroclastic* - fragmental products of volcanoes

*Protoclastic* (autoclastic) - magmas continue to move even after they are almost wholly crystallized so that many of their crystals become granulated and rounded by rubbing together during differential flow

*Cataclastic* - crushing and fragmentation of crystals due to post-consolidation movements

*Mylonitic* - granulation and shearing of the crystals are extreme

## II. Pyroclastic Rocks

### A. Size Distinctions

*Bombs* - fragments more than 32 mm in diameter which were partly or wholly molten when discharged. The resulting rock is called an *agglomerate*.

*Blocks* - fragments more than 32 mm across which were entirely solid when ejected. The resulting rock is called a *volcanic breccia*.

*Lapilli* - fragments measuring between 4 and 32 mm in diameter irrespective of their condition on discharge. The resulting rock is called a *lapilli tuff*.

*Ashes* - fragments whose diameter is less than 4 mm irrespective of their condition on discharge. The resulting rock is called a *tuff*.

### B. Distinction Based on Mode of Origin

*Essential* (juvenile) - fresh magmatic ejecta

*Accessory* - solid fragments of volcanic rock derived from the conduit and crater walls of an eruptive cone

*Accidental* - solid chips torn from the sub-volcanic basement, no matter whether igneous, metamorphic, or sedimentary

### C. Distinction Based on Content of Glass, Crystals, and Rock Debris

*Vitric ash* (tuff) - ashes and tuffs composed mainly of glassy particles

*Crystal ash* (tuff) - ashes and tuffs made up chiefly of crystals

*Lithic ash* (tuff) - ashes and tuffs in which accessory and accidental rock fragments predominate

\*Terms and definitions selected from: Williams, Turner, and Gilbert (1954) *Petrography*. W. H. Freeman and Company