

## Igneous Rocks

### Igneous - phaneritic or aphanitic

texture \	color >	light colored pink, white, gray green, lavender	medium to dark colored purple, greenish	dark gray to black	dark green to black
	minerals>	15 - 30% K- feldspar 10 - 40% quartz 0-33% Na plag. 8-15% amphibole and biotite	55-70% plagioclase feldspar 15-40% biot. & amphibole	25-70% Ca plagioclase 25-75% dark mafic minerals (pyroxene, amphibole, olivine)	0-5% plag. 65-100% olivine 0-25% pyroxene 0-10% ore minerals (magnetite, ilmenite, chromite)
composition		felsic sialic	intermediate	mafic	ultramafic
fine = aphanitic	extrusive volcanic	<b>Rhyolite</b>	<b>Andesite</b>	<b>Basalt</b>	<b>Komatiite</b>
coarse = phaneritic	intrusive plutonic	<b>Granite</b>	<b>Diorite</b>	<b>Gabbro</b>	<b>Peridotite</b>
environment		subduction zones	subduction zones	mid-ocean ridges, hot spots	mid-ocean ridges, mantle

descriptive terms used with above names:

- . . . porphyritic = crystals 2 to 3 times size of matrix, and >10% of rock is crystals.
- . . . . . porphyritic phaneritic = smaller crystals surrounds larger crystals (phenocrysts).
- . . . . . porphyritic aphanitic = massive, structureless ground mass surrounds crystals (phenocrysts).
- . . . vesicular = holes from gas bubbles escaping lava, making cinder-like or clinker-like appearance.

### Igneous - glassy

texture	composition	characteristics	name
glassy	? not applicable	massive, black glass	<b>Obsidian</b>
glassy	? not applicable	frothy, grey glass of subparallel glass fibers with many squashed air bubbles - may float	<b>Pumice</b>
glassy	? not applicable	grey glass, rounded spherical structures	<b>Perlite</b>

**Igneous - pyroclastic (fragmental)**

texture	composition	characteristics	name
pyroclastic	volcanic ash, pumice fragments, some rock fragments or glass	light colored volcanic ash, sometimes with glass and pumice fragments	<b>tuff</b>
pyroclastic	volcanic ash, pumice fragments, some rock fragments or glass	fine grained or gritty, light in weight if not compacted; light color	<b>ash fall tuff</b>
pyroclastic	volcanic ash, pumice fragments, some rock fragments or glass	particles or grains are fused or welded, with flow lines	<b>ash flow tuff</b>
pyroclastic	round pebbles and bombs that were blown out of a volcanic vent, with ash	volcanic fragments larger than 2 centimeters (about 1 inch in diameter)	<b>agglomerate</b>
pyroclastic	volcanic bombs, pebbles, ash, pumice fragments, some rock fragments, or glass	sharp, angular volcanic fragments larger than 2 centimeters (1 inch diameter) mixed with others	<b>volcanic breccia</b>

## Sedimentary Rocks

### Clastic Sedimentary Rocks

particles	size	minerals	character	general size	rock name
gravel	> 2 mm	rock fragments, quartz, feldspar	pebbles	coarse	<b>Conglomerate</b>
sharp gravel	> 2 mm	rock fragments, quartz, feldspar	angular	coarse	Breccia
coarse gravel to fine clay	> 2 mm	any rock type	poorly sorted, nonstratified, angular	fine to coarse	Tillite
sand	2- 1/16 mm	quartz, feldspar	granular	sandy	<b>Sandstone</b>
silt	1/16-1/256	clay, quartz	gritty	gritty, fine grained	<b>Siltstone</b>
clay	<1/256 mm	clay	platy massive	smooth, very fine grained	<b>Shale, Claystone</b>
silt & clay	< 1/16 mm	clay, quartz	massive	smooth, very fine grained	<b>Mudstone</b>

**Non-Clastic Sedimentary Rocks**

<b>mineral</b>	<b>chemical form</b>	<b>characteristics</b>	<b>rock name</b>
calcite	CaCO <sub>3</sub>	fizzes in HCl acid	<b>Limestone</b>
calcite	CaCO <sub>3</sub>	medium to coarse grained, fizzes in acid	<b>Crystalline Limestone</b>
calcite	CaCO <sub>3</sub>	microcrystalline, conchoidal fracture, fizzes in acid	<b>Micrite</b>
calcite	CaCO <sub>3</sub>	aggregates of small round spheres, fizzes in acid	<b>Oolitic Limestone</b>
calcite	CaCO <sub>3</sub>	fossils and fossil fragments loosely cemented, fizzes in acid	<b>Coquina</b>
calcite	CaCO <sub>3</sub>	fossils in calcareous matrix, fizzes in acid	<b>Fossiliferous Limestone</b>
calcite	CaCO <sub>3</sub>	shells of microscopic organisms and clay, soft, fizzes in acid	<b>Chalk</b>
calcite	CaCO <sub>3</sub>	banded calcite - cave deposits, fizzes in acid	<b>Travertine</b>
halite	NaCl	tastes salty, fine to coarse crystalline	<b>Salt</b>
gypsum	CaSO <sub>4</sub> ·2H <sub>2</sub> O	fine to coarse crystalline, softer than fingernail, white, grainy	<b>Gypsum</b>
microscopic quartz chalcedony	SiO <sub>2</sub>	cryptocrystalline, dense, conchoidal fracture, dull, very hard (scratches glass)	<b>Chert</b>
dolomite	CaMg(CO <sub>3</sub> ) <sub>2</sub>	fizzes in acid only if scratched first	<b>Dolomite</b>
carbon	C	brownish plant material - soft, porous, fibrous	<b>Peat</b>
carbon	C	black, vitreous, crumbly	<b>Coal</b>

## Metamorphic Rocks

### Foliated (banded) Metamorphic Rocks

characteristics	minerals	rock name
very thin layers, like blackboards very fine-grained smooth, flat surfaces, from slaty cleavage separate grains not visible dense, brittle, clinking sound	mica quartz clay (microscopic)	<b>Slate</b>
very, very thin, irregular layers of mica usually pale gray green satin sheen to rock rather than individual flakes fine to medium-grained uneven surfaces grains visible	mica quartz other minerals	<b>Phyllite</b>
thin, irregular layers of mica & platy minerals usually pale gray green medium-grained uneven surfaces grains visible	mica (muscovite, biotite) chlorite, talc; hornblende quartz, garnet; feldspar	<b>Schist</b>
thin, irregular layers of mica & platy minerals	bluish; mica, quartz	<b>Blueschist</b>
thin, irregular layers of mica & platy minerals	greenish color; mica, quartz, serpentine	<b>Greenschist</b>
thick bands, wavy, semi-continuous layers of white quartz, feldspar, and mica medium to coarse-grained banded, coarsely crystalline large, crystalline grains	feldspar quartz; mica or hornblende or garnet	<b>Gneiss</b>

**Non-foliated Metamorphic Rocks**

<b>characteristics</b>	<b>former rock</b>	<b>rock name</b>
very hard, smooth stretched and welded cobbles and pebbles = fractures through grains, not around them as in . . rougher conglomerate composed of rock fragments, quartz, chert	Conglomerate	<b>Metaconglomerate</b>
very hard, smooth welded sand grains - fractures through grains, not around them as in rougher sandstone composed mostly of quartz	Sandstone	<b>Quartzite</b>
fizzes in dilute acid medium to coarse grained sugary to crystalline composed of calcite ( $\text{CaCO}_3$ )	Limestone	<b>Marble</b>
very hard, flint-like fracture smooth, very fine-grained dark colored to black very dense, compact	Claystone, Slate, Mudstone, Shale	<b>Hornfels</b>
black to brown dense, highly altered plant remains Carbon, opaque, noncrystalline	peat	<b>Coal</b>



