

Metamorphic Rocks!

Write your own
Simplified
Definition.

A metamorphic rock is a type of rock which has been changed by extreme heat and pressure. Its name is from 'morph' (meaning form), and 'meta' (meaning change).[1]

The original rock gets heated (temperatures greater than 150 to 200 °C) and pressured (1500 bars).[2] This causes profound physical and/or chemical change. The original rock may be sedimentary rock, igneous rock or another older metamorphic rock.

There is always more pressure and higher temperature under the Earth's surface. In the root of a mountain chain or a volcano these forces will be enough to change shape of the strata and the minerals it is made of. Sedimentary rock which has been near such forces often looks as if a giant had twisted it and heated it over a fire.

Examples of metamorphic rock:

- Marble is a metamorphic rock formed from limestone.
- Slate is a metamorphic mudstone or shale.
- Quartzite is a metamorphic sandstone.

The recrystallisation of minerals after heating generally causes the destruction of any fossils the rocks might have contained.

Two Types of Metamorphism

Regional Metamorphism

Pressure
more than
Heat

Regional metamorphism, or dynamic metamorphism, occurs in great masses of rock. Rocks can be metamorphosed just by being at great depths below the Earth's surface. There they get high temperatures and the great weight of the rock layers above.

Much of the lower continental crust is metamorphic, except for recent igneous intrusions. Horizontal tectonic movements such as the collision of continents create orogenic belts. High temperature, pressures and deformation occurs along these belts. If the metamorphosed rocks are later uplifted and exposed by erosion, they are seen as long belts or other large areas at the surface.

Contact Metamorphism

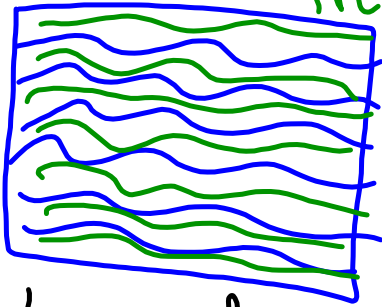
Contact metamorphism occurs when magma is injected into the surrounding solid rock (country rock). The changes that occur are greatest where the magma comes into contact with the rock. The temperatures were highest there and decreased with distance from it.

Heat
more than
Pressure

Texture:

Foliated

Mainly from Pressure.



Layered
or looks
Layered.

*Usually mainly
from Heat.*

Non-Foliated

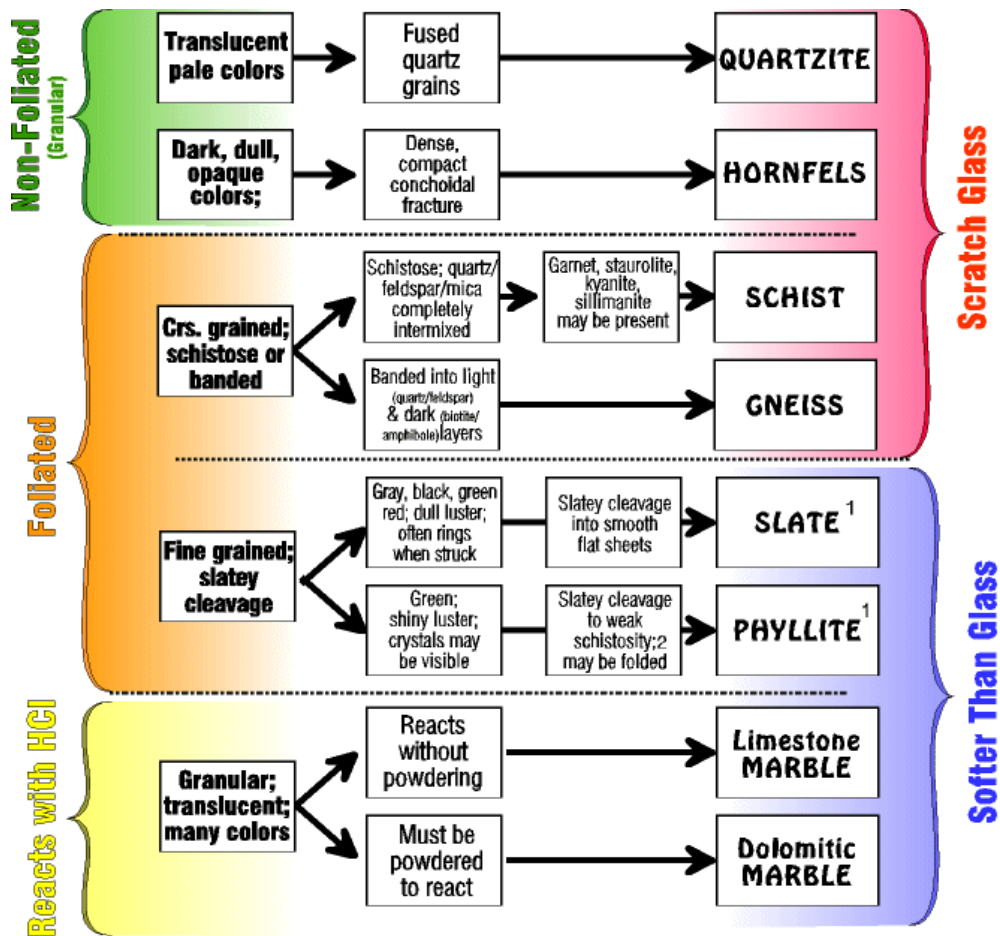


Mostly Recrystallization

different stages of Metamorphism *Type of Rock before Metamorph*

Rock Name	Texture	Grain Size	Comments	Parent Rock
1 st Slate	Foliated	Very fine	Excellent rock cleavage, smooth dull surfaces	Shale, mudstone, or siltstone
2 nd Phyllite		Fine	Breaks along wavy surfaces, glossy sheen	Slate
3 rd Schist		Medium to Coarse	Micas dominate, scaly foliation	Phyllite
4 th Gneiss		Medium to Coarse	Compositional banding due to segregation of minerals	Schist, granite, or volcanic rocks
Marble	Non foliated	Medium to coarse	Interlocking calcite or dolomite grains	Limestone, dolostone
Quartzite		Medium to coarse	Fused quartz grains, massive, very hard	Quartz sandstone
Anthracite		Fine	Shiny black organic rock that may exhibit conchoidal fracture	Bituminous coal

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1 (Shale), slate, and phyllite complete intergrade with each other. Distinctions may be difficult.

METAMORPHIC ROCK ANALYSIS AND CLASSIFICATION							
STEP 1: What are the rock's textural features?		STEP 2: What are the rock's mineralogical composition and/or other distinctive features?		STEP 3: Metamorphic rock name	STEP 4: What was the parent rock?	STEP 5: What is the rock used for?	
FOLIATED	Fine grained	Flat slaty rock cleavage is better developed than foliation	Dull luster; breaks into hard flat sheets along the slaty rock cleavage	SLATE ¹	Mudstone or shale	Roofing slate, table tops, floor tile, and blackboards	
		Wavy foliation well developed more than rock cleavage	Breaks along wrinkled or wavy foliation surfaces with shiny metallic luster	PHYLLITE ¹		Construction stone, decorative stone, sources of gemstones	
	Medium to coarse grained	Schistosity: foliation formed by alignment of visible crystals; rock breaks along scaly foliation surfaces; crystalline texture	Visible sparkling crystals of platy minerals (chlorite, biotite, muscovite), bladed crystals (kyanite), or prismatic crystals (amphiboles, tourmaline, sillimanite); breaks along scaly foliated surfaces	SCHIST ¹ Chlorite schist Muscovite schist Biotite schist Kyanite schist Amphibole schist Tourmaline schist Sillimanite schist		INCREASING METAMORPHIC GRADE ↓	
		Gneissic banding: minerals segregated into alternating layers gives the rock a banded texture in side view; crystalline texture	Visible crystals of two or more minerals in alternating light and dark foliated layers	GNEISS ¹			
FOLIATED OR NONFOLIATED	Medium to coarse grained	Mostly visible crystals of amphibole (usually glossy black hornblende)	AMPHIBOLITE	Basalt, Gabbro, or Ultramafic igneous rocks	Construction stone		
NONFOLIATED	Fine grained	Glassy texture; rock cleavage may barely be visible	Black glossy rock that breaks along uneven or conchoidal fractures (Figure 7.12)	ANTHRACITE COAL	Peat, Lignite, Bituminous coal		
		Microcrystalline texture	Usually a dull dark color; very hard	HORNFELS	Any rock type	Decorative stone	
		Microcrystalline texture; may have smooth rock cleavage surfaces or asbestos form	Serpentine; dull or glossy; color usually shades of green	SERPENTINITE	Basalt, Gabbro, or Ultramafic igneous rocks		
		Microcrystalline texture that feels soapy	Talc; can be scratched with your fingernail; shades of green, gray, brown, white	SOAPSTONE		Art carvings, electrical insulators, talcum powder	
	Fine to coarse grained	Sandy texture or crystalline texture	Quartz sand grains fused together; grains will not rub off like sandstone, usually light colored	QUARTZITE ¹	Sandstone	Construction stone, decorative stone	
			Calcite (or sometimes dolomite) crystals of nearly equal size and tightly fused together; effervesces in dilute HCl	MARBLE ¹	Limestone	Art carvings, construction stone, decorative stone, source of lime for agriculture	
Conglomeratic texture, but breaks across grains		Pebbles stretched or cut by rock cleavage	META-CONGLOMERATE	Conglomerate	Construction stone, decorative stone		

¹Modify rock name by adding names of minerals in order of increasing abundance. For example, garnet muscovite schist is a muscovite schist with a small amount of garnet.