

UNIVERSITY OF ZAMBIA
GEOLOGY DEPARTMENT, SCHOOL OF MINES

GGY3051: ENGINEERING GEOLOGY

INTRODUCTION TO ROCKS

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Learning objective

Participants will be able to identify rocks by
Major geological classifications of rock types
and groups.

Defining Petrology

A. Petrology is the branch of geology that studies the **origin, composition, distribution** and **structure** of rocks.

(from the Greek language : petra-"rock" and logos- "study")

A. “Lithology” was once approximately synonymous with petrography, but in current usage, lithology focuses on macroscopic **hand-sample** or **outcrop-scale** description of rocks, while **petrography** is the **specialty** that **incorporates** and deals with **microscopic details**.

Sub-branches of Petrology:

- There are three branches of petrology, corresponding to the three types of rocks:
 1. Igneous Petrology
 2. Metamorphic Petrology, and
 3. Sedimentary Petrology

Sub-branches of Petrology:

1. Igneous petrology:

- ✓ Focuses on the composition and texture of igneous rocks (rocks such as granite or basalt which have crystallized from Molten rock or magma).

Sub-branches of Petrology:

2. Sedimentary petrology

- ✓ Focuses on the composition and texture of sedimentary rocks (rocks such as sandstone, shale

Sub-branches of Petrology:

2. Metamorphic Petrology:

- ✓ Focuses on the **composition and texture of metamorphic rocks** such as slate, marble, gneiss, or schist which started out as sedimentary or igneous rocks but which have undergone chemical, mineralogical or textural changes due to **extremes of pressure, temperature or both**).

Framework Petrology:

- **Definition of rock:**

- a. In geology, **rock** is a naturally occurring **solid aggregate of one or more minerals or mineraloids**.
- b. For example, the common rock granite is a combination of the **quartz, feldspar and biotite minerals**.

The Earth's outer solid layer, the lithosphere, **is made of rock**.

- c. **Rocks** have been used by **mankind throughout history**. From the Stone Age, rocks have been used for tools. The **minerals and metals found in rocks** have been essential to human [civilization](#).

Framework of Petrology cont'd.

d. Three major groups of rocks are defined:

- i. Igneous Rocks,
- ii. Sedimentary Rocks, and
- iii. Metamorphic Rock.

The scientific study of these rocks is called petrology.

Igneous Rocks:

- Igneous rocks are formed by crystallization of molten magma
include volcanic and plutonic rocks.

Structure and texture of igneous rocks:

- The texture of igneous rocks depends on the composition of the magma and the conditions surrounding the magma's cooling.
- The textures are different in intrusive, vein, and extrusive rocks.
Intrusive rocks are characterized by:
 - ✓ A holocrystalline texture, in which all the rock material is crystallized.
 - ✓ also depends on the shape of the crystals of the component minerals.

Sedimentary rocks:

- ✓ Are formed by **consolidative processes** of sediments originating from **preexisting** rocks and rock material.

Structure and texture of Sedimentary rocks:

- The **relationship** between **rock structure** and **texture** and rock genesis is more pronounced in sedimentary rocks than in igneous rocks.
- Clastic rocks consist of detrital (clastic) grains of various sizes and shapes.
- The grains, which can be **angular**, **subrounded**, or **rounded**, sometimes lie freely without attachment.
- The structure of clastic rock, which depends on the mutual arrangement of the grains, **can be random**, **laminar**, or **fluidal**.
- With a random structure, the particles do not have an ordered arrangement.

Metamorphic rocks:

- ✓ Arise from the transformation of existing rock types, in a process called metamorphism, which means "change in form".
- ✓ The original rock (protolith) is subjected to ranges of extreme pressure and or heat (temperatures greater than 150 to 200 °C) causing profound physical and/or chemical change.

Structure and texture of Metamorphic rocks:

- The **structures** and **textures** of metamorphic rocks are influenced by the chemistry of parent or source rocks and the metamorphic path that the rocks are subjected to
- Thus the **structures** and **textures of metamorphic rocks** arise during the recrystallization in the solid state of primary sedimentary and magmatic rocks.
- The recrystallization occurs under the action of lithostatic pressure, and temperature, which leads to an ordered arrangement of the mineral Grains?

End of Introduction to rocks