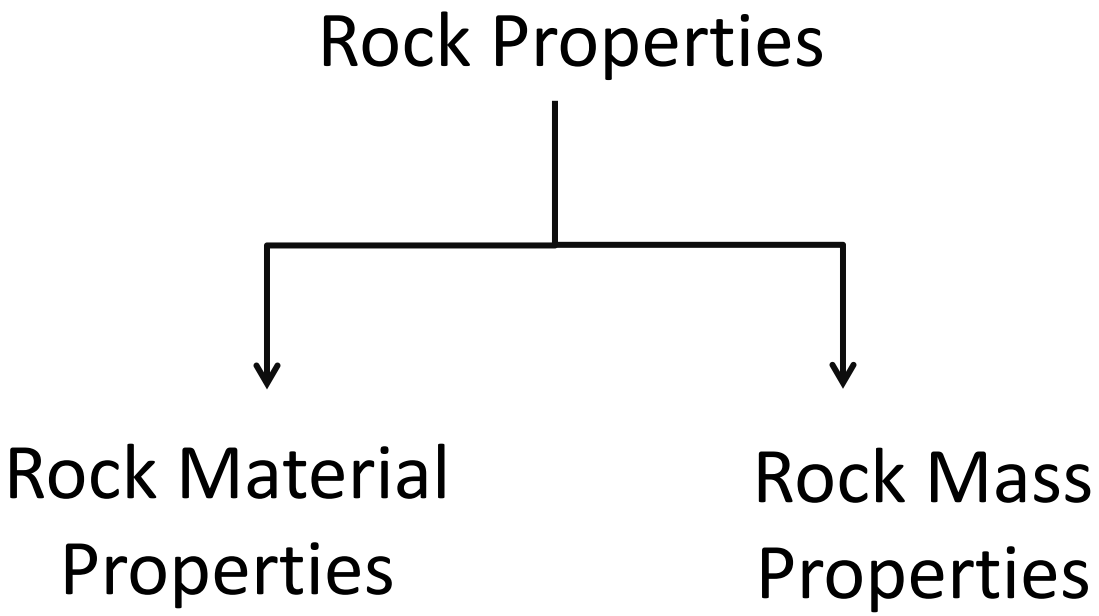
Engineering Geology

Lecture-4

Continued from Previous Lecture



Classification of Rocks & Minerals

- Identification of common rock forming minerals
- Classification of Rocks and Minerals
  - Color of grain with respect to rock color Chart of Geological Society of America.
  - Identification of grains (coarse, medium and fine) of sedimentary rocks.
  - Hardness classification (very soft, soft etc) with respect to simple field tests and uniaxial compression strength.

Common Rock Forming Minerals

Scientists have identified over 4,000 different minerals. A small group of these minerals make up almost 90% of the rocks of Earth's crust. These minerals are known as the common rock-forming minerals.

To be considered a common rock-forming mineral, a mineral must:

A) Be one of the most abundant minerals in Earth's crust;

B) Be one of the original minerals present at the time of a crustal rock's formation; and,

C) be an important mineral in determining a rock's classification.

Minerals that easily meet these criteria include: plagioclase feldspars, alkali feldspars, quartz, pyroxenes, amphiboles, micas, clays, olivine, calcite and dolomite.

Minerals of the Oceanic Crust

As an example of the influence of just a few minerals, let's consider the rocks of the oceanic crust. The oceanic crust is mainly composed of basalt and gabbro. These two rock types are made up of mainly of plagioclase feldspar and pyroxenes, with smaller amounts of olivine, micas and amphiboles. This small group of minerals makes up most of the rocks of the oceanic crust.

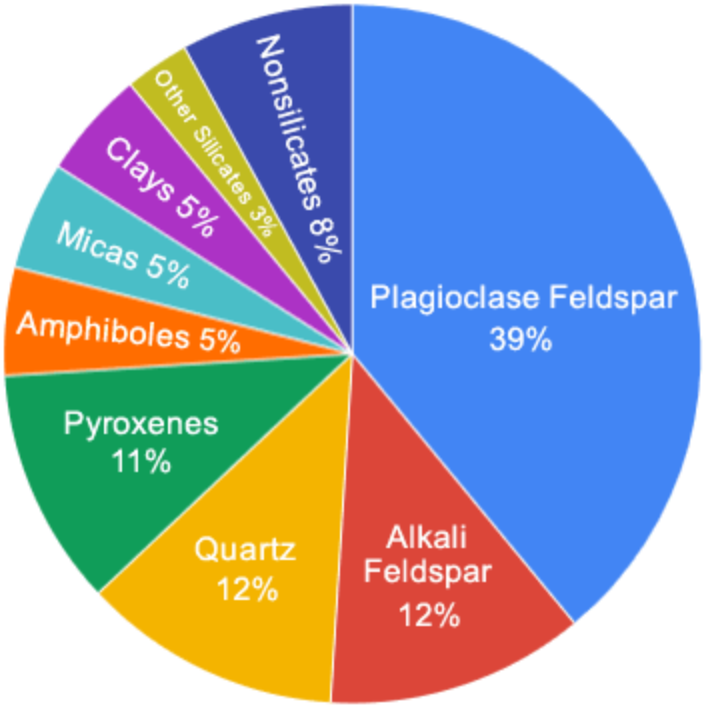
Minerals of the Continental Crust

As a second example, let's consider the rocks of the continental crust. The continental crust is made up mainly of rocks with a granitic to andesitic composition. These rocks are composed mainly of alkali feldspar, quartz, and plagioclase feldspar, with smaller amounts of amphiboles and micas. This small number of minerals makes up most of the continental crust.

Minerals in the Sedimentary Cover

Both the oceanic and continental crusts are partly covered with a thin layer of sedimentary rocks and sediments. These consist mainly of clastic rocks such as sandstone, siltstone and shale, along with carbonate rocks such as dolostone and limestone. These clastic rocks are composed of mainly quartz, clay minerals, and a small amount of micas and feldspar minerals. The carbonate rocks consist primarily of calcite and dolomite. A small number of materials, composed of a small number of minerals, make up most of the sediment and sedimentary rocks that cover the continents and ocean basins.

Most Abundant Minerals in Earth's Crust



Relative Abundance of Common Rock-Forming Minerals in Major Rock Types

Major Rock Types \ Rock-Forming Minerals	Plagioclase Feldspar	Alkali Feldspar	Quartz	Pyroxenes	Amphiboles	Olivine	Micas	Clays	Calcite / Dolomite
Basalt	●			●	•	●	•		
Gabbro	●			●	•	●	•		
Granite	•	●	●		●		•		
Andesite	●	•	•	•	●		•		
Sandstone	•	•	●				•	•	
Shale			●				•	●	
Carbonates			•					●	●