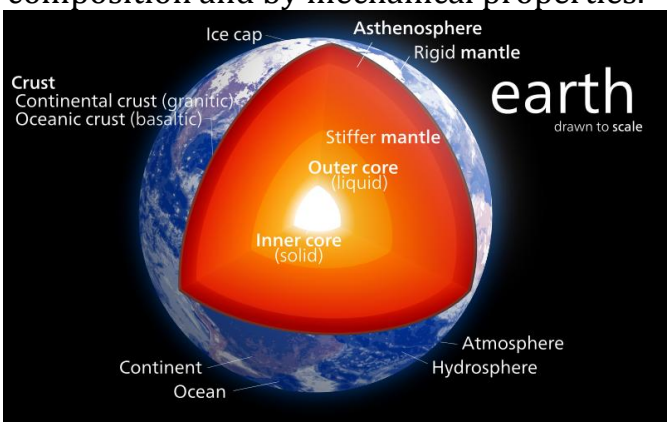
Types of Rocks and Lithosphere

The Composition and Structure of Earth

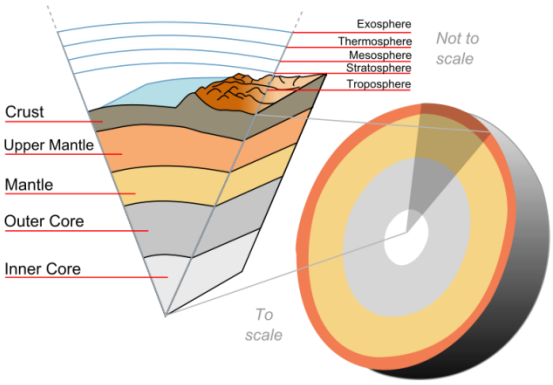
Core, mantle, and crust are divisions based on composition. The crust makes up less than 1 percent of Earth by mass, consisting of oceanic crust and continental crust is often more felsic rock. The mantle is hot and represents about 68 percent of Earth's mass. Finally, the core is mostly iron metal. The core makes up about 31% of the Earth. Lithosphere and asthenosphere are divisions based on mechanical properties. The lithosphere is composed of both the crust and the portion of the upper mantle that behaves as a brittle, rigid solid. The asthenosphere is partially molten upper mantle material that behaves plastically and can flow. This animation by Earthquide shows the layers by composition and by mechanical properties.



Crust and Lithosphere

Earth's outer surface is its crust; a cold, thin, brittle outer shell made of rock. The crust is very thin, relative to the radius of the planet. There are two very different types of crust, each with its own distinctive physical and chemical properties. Oceanic crust is composed of magma that erupts on the seafloor to create basalt lava flows or cools deeper down to create the intrusive igneous rock gabbro. Sediments, primarily muds and the shells of tiny sea creatures, coat the seafloor. Sediment is thickest near the shore where it comes off the continents in rivers and on wind currents. Continental crust is made up of many different types of igneous, metamorphic, and sedimentary rocks. The average composition is granite, which is much less dense than the mafic igneous rocks of the oceanic crust. Because it is thick and has relatively low density, continental crust rises higher on the mantle than oceanic crust, which sinks into the mantle to form basins. When filled with water, these basins form the planet's oceans.The lithosphere is the outermost mechanical layer, which behaves as a brittle, rigid solid. The lithosphere is about 100 kilometers thick. The definition of the lithosphere is based on how earth materials behave, so it

includes the crust and the uppermost mantle, which are both brittle. Since it is rigid and brittle, when stresses act on the lithosphere, it breaks. This is what we experience as an earthquake.



Rocks: Notes on Types and Characteristics of Rocks Found on the Earth's Crust !

The earth's crust is composed of rocks and on the basis of mode of formation, rocks are classified into three major types — Igneous rocks, Sedimentary rocks and Metamorphic rocks.

Igneous, Sedimentary and Metamorphic Rocks

1. Igneous Rocks:

Igneous rocks are solidified from mineral matter in a high temperature molten state, that is, from "Magma". These are the most abundant constituents and to a certain extent, all other rocks originate from igneous rocks. Therefore, they are known as primary rocks. The molten material which is thrown out of open-ings of the earth's crust and pours into earth's sur-face and solidifies is called extrusive rocks.

Masses of igneous rocks that have solidified far beneath the earth's surface are called plutonic rocks. The chemi-cal composition of igneous rocks varies from acidic to basic. These rocks can be distinguished on the basis of solidification. The most

common, fine grained, extrusive rock is ‘basalt’. Granite, an acidic coarse grained plutonic rock has same chemical composi-tion as ‘Rhyolite’.

Rapid cooling of lava results in small crystals giving rock a fine-grained texture. Sudden cooling of magma yields a volcanic glass. The rocks, rich in felsic minerals like granite and diorite are felsic rocks, whereas those rich in mica and iron, as in gabbro and basalt are called mafic rocks. The extensive mafic types are ultramafic rocks.

2. Sedimentary Rocks:

These are layered accumulations of mineral particles derived in various ways from pre-existing rocks or formed by remains of organically formed matter (liv-ing or once-living things), or from deposits created by chemical actions. Sandstone, clay rock, conglom-erates (e.g. gravel, pebbles) are mechanically formed rocks. Peat, lignite, coal are organically formed rocks. Gypsum, chalk, limestone are examples of chemical sedimentation.

These rocks cover three-fourth of earth’s surface and make up five per cent of the volume of the earth’s crust. As sedimentation is favoured by water, so they are mostly formed under water. Loess is an example of fine sand carried by wind and deposited as wind borne sedimentary rocks.

A characteristic feature is their layered arrangement called strata. Layers of different textual composition are alternated or interlayered. The planes of separa-tion are known as bedding planes. The fact that they are derived from accumulated sediments is strength-ened by the presence of fossils, upper marks, cross bedding and modules.

3. Metamorphic Rocks:

When the original character of rock undergoes changes under favourable conditions of heat and pres-sure, it gives rise to metamorphic rocks. Metamor-phic in Greek language mean ‘change of form’. These rocks are harder and more compact than their origi-nal types. Schist is a metamorphic rock. It has a struc-ture called ‘foliation’. Quartzite, marble, gneiss is examples of metamorphic rocks.

There are two types of metamorphism:

1) Dynamic metamorphism:

The formation of metamorphic rocks under the stress of pressure, e.g., Granite converted into gneiss.

2) Thermal/contact metamorphism:

The change of form of recrystallization of mineral of sedimen-tary and igneous rocks under the influence of high temperature within the earth's crust.