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SOIL FORMING ROCKS AND MINERALS

Geology is the science of the earth, its composition and structure, its history and its past plant and animal life.

Geology it is independent science, and it also rests upon a foundation of Astronomy, Chemistry, Physics and Biology.

Geology – closely related to anthropology, geography and economics

1. Astronomy : We have to study the earth – its origin, its place in Solar System and its relation to the universe as a whole. These are matters of astronomy.
2. Physics and Chemistry – Study of the composition and structure of the earth involves questions of chemistry and physics.
3. Geology & Biology – The evolution of living things is a common concern of geology and biology, the justification for including the history of life in geology is that the records of that history found in the rocks.
4. Anthropology which treats man's biological and cultural history, shares with geology the date of human skeletal remains and primitive artifacts.
5. Geography – closely related to earth resources area boundaries etc.
6. Economics – Available source like iron, oil, coal, gold and other earth resource.
7. Mathematics is the fundamental to every physical science.

3. Striation : The parallel thread-like lines or narrow bands running across the surfaces of a mineral are called striations. These are reflections of the internal arrangement of atoms of crystals. These are clearly observed on crystals of quartz, feldspars and pyrite.

4. Hardness : The resistance of a mineral to scratching is known as hardness. The hardness is expressed in Mho's scale and indicated by numbers (1 to 10). Minerals vary widely in their hardness; talc is the softest and diamond the hardest mineral known

Hardness (Mho's scale)	Mineral Substances	Test
1.	Talc	Scratches by finger nail
2.	Gypsum	Just scratches by a finger nail
3.	Calcite	Scratches not easily by a copper coin piece
4.	Flourite	Scratches easily by a steel knife
5.	Apatite	Just scratches by a knife
6.	Feldspar eartho clase	Scratches soft glass
7.	Quartz	Scratches glass easily
8.	Topaz	Scratches glass but not hard enough to be used as grinding material
9.	Carborundum or Corundum	Very hard and used as grinding material for all minerals
10.	Diamond	hardest mineral known

The kind and proportions of mineral(s) found in a soil depend on the kind of parent material and the weathering intensity. The most common clay mineral observed is illite. Smectite predominates in the cracking clay soils.

Kaolinite in the highly weathered soils of the intertropical zones (Southern India, South America, South-east Asia) and altapulgite or palygorskite (with gypsum and calcite) in the arid regions (Central and Southern Iraq, Western India).

The common mineral (in descending order) as observed in the dominant soil groups of India and Iraq are :

1. Alluvium – derived soils : illite (Vermiculite) Chlorite/ montmorillanite, Kaolinite (in flood plains and basin)
2. Forest Soils : illites, Chlorite (Vermiculite), montmorillanite, Kaolinite.
3. Black (Cotton) Soils : Smectite, illite, chlorite
4. Desert soils : illite, attapulgite (Smectite in basin depressions)

   Psendochlorite, Vermiculite (in normal cultivated soils)
5. Red & Lateritic soils : Kaolinite (gibbsite), chlorite, illite

Clay minerals – high surface area – more negative charge on them, they are a source of cation adsorption and cation release, considered important in basic soil fertility.

Non-Silicates

Oxides, Hydroxides or Hydrous Oxide Group of Minerals

Oxygen is present in great abundance (46.7%) in the earth's crust. The oxide minerals are formed by the direct combination of elements (present in earth's crust) with oxygen. e.g. $4Fe + 3O_2 \rightarrow 2Fe_2O_3$, $2Al + 3O_2 \rightarrow 2Al_2O_3$

Group :

The oxides are usually harder than any other mineral, except the silicates. The most important soil forming oxide minerals are

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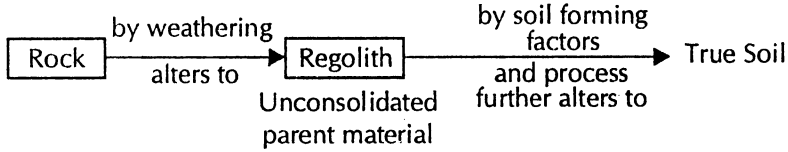
WEATHERING OF ROCKS AND MINERALS

Soils are formed from rocks through the intermediate stage of formation of regolith which is the resultant of weathering



1. The formation of Regolith by the break down (weathering) of the bed rocks. (Weathering = The breaking down or disintegration of rocks by physical, chemical and biological process)
2. the addition of organic matter through the decomposition of plant and animal tissues, and reorganisation of these components by soil forming processes (eluviation and illuviation) to form soil which is three-dimensional natural body having unique characteristics (Fig. 6).

The initial stage of soil formation by the disintegration of bed rocks involves a set of processes, known by the term weathering. Weathering is, therefore, the process of disintegration and decomposition of rocks and minerals which are brought about by physical and chemical weathering, respectively, leading to the formation of regolith (unconsolidated residues of the weathering rock on the earth's surface or above the solid rocks). The regolith, or at least its upper portion, may therefore be termed as parent material of soils.