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Clay Mineralogy

The fraction of Soil that is finer than 2μ is called clay fraction. This may contain clay minerals as well as non-clay minerals such as finely ground quartz, feldspar, or mica or "clay" size (rock flour) Clay minerals (as distinguished from rock flour) develop ~~plastically~~ plasticity when mixed with a limited amount of water.

Most clay minerals are the product of chemical weathering of rock-forming minerals such as feldspar and mica. The 3 major clay mineral groups are
(i) Kaolinite
(ii) Illite
(iii) Montmorillonite.

Other common clay minerals are Halloysite, Chlorite and Unconsolidated.

Soils in general are usually products of rock weathering, and thus the most abundant Soil minerals are the common rock-forming minerals and those that are more resistant to chemical physical weathering.

Clay and clay-based minerals Properties

(1) Clay minerals as electron Acceptor /or donors in organic reaction:

The electron-accepting and the electron-donating sites of clay can be explained by the fact the electron acceptor sites are aluminium at crystal edges and transition metals in the lower valency state. The catalysed polymerisations involve the conversion of the organic molecule to a reactive intermediate; hence, the clay mineral accepts an electron from the clay/ monomer and a radical cation is formed, where the organic compound gains an electron and forms a radical anion

(11) Ion Exchange and Cation Exchange Capacity

When erosion, transport, and deposition take place, Clay minerals results to change in the environment. Ion Exchange, reconstruction of degraded mineral, and formation of one type clay-based mineral from another or simpler substance appear as a result of these processes.

(11) Swelling behaviour

Clay minerals swelling is dependent on clay mineral type, the electrolyte concentration and the nature of the cations in the solution. The swelling mechanism can be grouped into mechanical and physicochemical processes.

(a) Adsorptive and low permeability properties

As absorptive materials, there are 3 ways, clay minerals and clay-based minerals can exert non-covalent adsorptive pull on various molecules from liquid to gaseous states. Firstly physical adsorption: there is non-ionic adsorption onto the surfaces of finely divided material Large surface areas of clay minerals are composed in small columns), secondly ion exchange adsorption through electrostatic interaction and exchange,

(2) Clay Minerals classified by its structure and layer type

The interaction between clay minerals depends on their structure. This structure controls the behaviour of clay Minerals' double layers which is the primary generator of repulsive pressure in the double layer model - The forces controlling the repulsive pressure term generated by physicochemical Swelling in clay minerals sum the attractive forces by comparison are small within the range of the external forces involved in the clay structure.

Clay minerals classified by the structure

(1) Absorption
(2) Layer Charge
(3) Polytypism
(4) Mixed Layers Structures

GEOLOGY OF NIGERIA

The geology of Nigeria formed beginning on the Archean and Proterozoic eons of the Precambrian. The Country forms the Nigerian Province and more than half of its Surface is Igneous and metamorphic Crystalline basement rock from the Precambrian between 2-a billion and Sourmillion years ago, Nigeria was affected by 3 mayor orogeny Mountain-building events and related Igneous intrusions.

(1) Basement Complex

The Basement Complex forms a part of the pan-African mobile belts and lies between the west African and Congo Cratons and South of the Tauredy Shield.

Umajor petro-lithological units are

(1) migmatite gneiss Complex.
The schist Belt
The older granites
Undeformed acid and base dykes

(2) Sedimentary Basins

1 Calabar flank
2 Benue trough
3 Chad Basin
4 Sokoto basin (Sokoto embayment)
5) Dahomey basin
(6) Niger Delta Basin

(3) Mineral resources

① Mineral is a naturally occurring crystalline inorganic Substance that has a specific chemical formula and a crystal structure. Mineral resources are the accumulations of Naturally occurring materials or commodity found on or in the earth and can be extracted profitably.

① Energy minerals
② Metallic minerals
③ Industrial minerals