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Clay minerals are the major constituents of fine-grained sediments and rocks (mudrocks, shales, claystones, clayey siltstones, clayey oozes and argillites).

They are important constituent of soils, lake, estuarine, delta and the ocean sediments that cover most of the Earth's surface. They are also present in almost all sedimentary rocks, the outcrops of which cover approximately 75% of the Earth land surface. clays which form in soils or through weathering principally reflect climate, drainage, and rock types.

Clay minerals form in the presence of water and have been important to life, and many theories of abiogenesis involve them. They are important constituents of soils, and have been useful to humans since ancient times in agriculture and manufacturing. Clay minerals are hydrous aluminium phyllosilicates, sometimes with variable amounts of iron, magnesium, alkali metals, alkaline earths and other cations found on or near some planetary surfaces. They are relatively rare in the solar system, though they occur extensively on Earth where water has interacted with other minerals and organic matter. Clay minerals have been detected at

several locations on mars, including Echus chasma, Mawrth vallis, the Memnonia quadrangle and the Elysium quadrangle. Spectography has confirmed their presence on asteroids including the dwarf planet Ceres and Tempel 1, as well as Jupiter's moon Europa.

Clay minerals can be classified as 1:1 or 2:1 This originates because they are fundamentally built of tetrahedral silicate sheets and octahedral hydroxide sheets. A 1:1 clay would consist of one octahedral sheet and one tetrahedral sheet, e.g Kaolinite and serpentinite. A 2:1 clay consists of an octahedral sheet sandwiched between two tetrahedral sheets, eg talc, vermiculite and montmorillonite.

The crystallographic structure of clay minerals became better understood in the 1930s with advancements in the x-ray diffraction (XRD) technique indespensable to decipher their crystal lattice. Standardization in terminology arose during this period as well with special attention given to

similar words that resulted in confusion such as sheet and plate.

As most clays are made from minerals, they are highly biocompatible and have interesting biological properties. Due to the disc-shaped and charged surfaces, Clay interacts with a range of macromolecules such as drugs, protein, polymers, DNA e.t.c some of the application of Clay include drug delivery, tissue engineering and bioprinting.

PROPERTIES of SOIL MINERALS

Clays form flat hexagonal sheets similar to the micas. Clay minerals are common weathering products [including weathering of feldspar] and low-temperature hydrothermal alteration products. Clay minerals are very Common in soils, in fine-grained sedimentary rocks such as Shale, mudstone, and siltstone and in fine-grained metamorphic Slate and phyllite. Clay minerals are usually ultrafine-grained [normally considered to be less than 2 micrometers].

GEOLOGY OF NIGERIA

The basement complex is one of the three major litho-petrological components that make up the geology of Nigeria. The Nigerian basement complex forms a part of the Pan-African mobile belt and lies between the west African and Congo cratons. and south of the Tuareg Shield. It is intruded by the mesozoic calc-alkaline ring complexes [younger granites] of the Jos plateau and is unconformably overlain by cretaceous and younger sediments.

The Nigerian basement was affected by the 600 ma Pan-African orgeny and it occupies the reactivated region which resulted from plate collision between the passive continental margin of the west African craton and the active pharasian continental margin. The basement rocks are believed to be the results of at least four major orogenic cycles of deformation, metamorphism and remobilization corresponding to the Liberian [2,700 ma], the Eburnean [2,000 ma], the Kibaran [1,100 Ma] and the pan-African cycles [600 ma]