**ADAM TIZHE ZIRRA**

**17/ENG03/061**

Read and write extensively on clay minerals and their distinct properties

Write comprehensively on geology of Nigeria

**Answer**

Clay minerals are the characteristic minerals of the earths near surface environments.

Clay minerals are composed of two basic structural units

1. Tetrahedral unit
2. Octahedral unit

Tetrahedral Unit: consists of a silicon atom surrounded by four oxygen atoms. Forming the shape of a tetrahedron. Oxygen atoms are at the tips of the tetrahedron, whereas the silicon atom is at its center. An individual unit cannot exist in nature.

Octahedral unit: consists of six hydroxyls forming a configuration of an octahedron and having one aluminium atom in its center. As the aluminium has three positive charges, an octahedral unit has 3 negative charges. Because of net negative charges, an octahedral unit cannot exist in isolation.

**Kaolinite mineral**

Kaolinite is the most common mineral of kaolinite group of minerals. Its basic structural unit consists of an alumina sheet (gibbsite) (G) combined with a silica sheet (S). Tips of the silica sheet and one base of the alumina sheet form a common interface. The structural units join together by hydrogen bond, which develops between the oxygen of silica sheet and the hydroxyls of alumina sheet. As the bond is fairly strong, the mineral is stable. The kaolinite mineral is electrically neutral.

**Halloysite:** is a clay mineral which has the same basic structure as kaolinite, but in which the successive units are more randomly packed, and separated by a singular layer of water. The properties of halloysite depends upon this water layer. If the water is removed by drying, the properties of the minerals drastically change.

**Montmorillonite mineral**

Montmorillonite is the most common mineral of the montmorillonite group of minerals. The basic structural unit consists of an alumina sheet sandwiched between two silica sheets. Successive structural units are stacked one over another, like leaves of a book. Montmorillonite minerals have lateral dimensions of 0.1 u to 0.5 u and the thickness of 0.001 u to 0.005 u. The specific surface is about 800m3/gm.

**Illite minerals**

Illite is the main mineral of the Illite group. The basic structural unit is similar to that of the minerals montmorillonite. However, the mineral has properties from montmorillonite due to the following reasons.

1. The lattice of Illite is stronger than that of montmorillonite, and is, therefore less susceptible to cleavage.
2. Illite swells less than montmorillonite. However, swelling is more than in kaolinite.