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Letter to Editor
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Clay Mineral Analysis for Water Filtration and Other Industrial Metallurgic Applications

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Letter to Editor

Multiple methods were used to characterise seven F clays and clay minerals in terms of their potential use in water purification and other industrial domains. SEM was used to assess morphology, while EDX, XPS, and XRD were used to quantify chemical/mineral compositions, and FT-IR and UV techniques were used to study functional groups, including the physical and chemical behaviours of adsorbed species. Zeta potential tests were used to assess the stability in aqueous solution. The combined results showed that the clays are largely kaolin and illite, and the clay minerals are mostly gibbsite and quartz, however additional clay-associated minerals and elements were also found. Due to the presence of exchangeable cations and electrophoresis properties, two of the characterised samples will find suitable application in the production of filter media for water purification, while the others have potential industrial applications for refractory linings, ceramics, medical, beauty, and cosmetics products. This result implies an increase in local content utilisation and a value addition to minerals in Nigeria. The study's findings are being utilised to design and ease the manufacture of expanded clay aggregate for the construction of low-cost water filters to solve the problem of insufficient access to drinkable water in Africa and other developing continents.

Water that is clean and uncontaminated is crucial for the health of both plants and animals. Water is required for the metabolic and catabolic processes in the human body to work properly. Every human being has the right to sufficient, safe, acceptable, physically accessible, and cheap water, according to the United Nations' 2006 report on power, poverty, and the worldwide water problem. Water is essential for socioeconomic growth, agriculture, household life, industry, and a healthy eco-system. Every human being has the right to adequate, safe, acceptable, physically accessible, and reasonably priced water. Chemicals, heavy metals (from wastewater, fertilisers, pesticides, mining operations, industrial pollution, and others), pathogens, microorganisms, and other toxicological pollutants are commonly found in fresh water sources. Filtration, a typical process used in water purification, is one approach for eliminating these toxins. It employs a medium in the form of a membrane or aggregates. While adsorbing and absorbing pollutants on the media, filtration employs both physical and chemical processes. Ceramic (clay) membranes for point-of-use filtration, cloth or fibre membranes, compressed granular activated carbon (GAC), polymer membranes, sand, gravel, or crushed rock, and clay aggregates are examples of filtration medium. Clay has played an important part in water purification technologies, in addition to other economic benefits such as artefacts, medicines, construction materials, electrochemical research, cosmetics, pharmaceuticals, earthen goods, and agriculture.

Filtration, which is a typical method of water purification, is one approach to remove harmful toxins. It employs a membrane or aggregates as a medium. When adsorbing and absorbing pollutants on the media, filtration employs both physical and chemical processes. Ceramic (clay) membranes for point-of-use filtration, cloth or fibre membranes, compressed granular activated carbon (GAC), polymer membranes, sand, gravel, or crushed rock, and clay aggregates are only a few of the filtration media available. Clay has played an important part in water purification technologies, as well as other economic benefits such artefacts, medicines, construction materials, electrochemical research, cosmetics, pharmaceuticals, earthen products, and agriculture. The principal clay components are kaolin and illite, with related minerals including quartz, gibbsite, antigorite, berlinite, sudoite, amesite, chlorite, lizardite, and leucite. The findings of this study are presently being utilised to determine the best type of clay to use in the production of expanded clay aggregates for use in the design and fabrication of low-cost water filters. The study's conclusion is that these clays may be utilised for a variety of applications depending on their properties, hence enhancing local content mineral consumption and value addition in Nigeria. The plastic behaviour of the clays, their mineral oxides, and the thermal analysis of the minerals will be studied in the future. Together with the current study, the projected outcome will serve as a guide to selecting the right study.

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