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Economic Potentials of Clay Deposit in Akanu Ibiam Federal Polytechnic Unwana, Afikpo North Ebonyi State

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Abstract:

Different studies and investigations have proved that Unwana town is rich in argillaceous rocks of considerable economic importance. The clays and shales range in age from the cretaceous of tertiary in the geological time frame. The clays deposited during the cretaceous period are richer in qualities. The study shows that Unwana clays are high in refractory (SiO_2 and Al_2O_3) with corresponding low fluxes (MgO , CaO , K_2O Na_2O TiO_2) which makes them good materials for making of low duty refractories, vitrifying and non vitrifying structural clay wares and finished ceramic products. Also the high cost and frequent shortage of cements and the occurrence of large deposit of clay minerals within Akanu ibiam federal polytechnic and the need to have varied construction material necessities the establishment of brick factories too.

Key words: Unwana clay, Refractories, Ceramic wares, Economic importance, Geological deposits

1. Introduction

Unwana is located at the extreme north – east of Ebonyi State, and it lies approximately on 6 north latitude and 8 east longitudes. The area is well drained by subterranean streams which appears on the surface and flow through the ancient water beds between ridges. However due to the geology of the area, sedimentary deposits abound which is responsible for their rich clay and shale deposit.

The industrial use of clay depends upon whether its characteristics meet the requirement of the product to be produced. In Nigeria, little attention is being paid to ceramic industries which in turn are having an adverse effect on the building sectors and general economy of our developing nation.

The important role played by clays on the development of the nations industries worldwide, can never be over emphasized. Little wonder countries like china, American, and some parts of Europe depends on this single sedimentary deposits as their

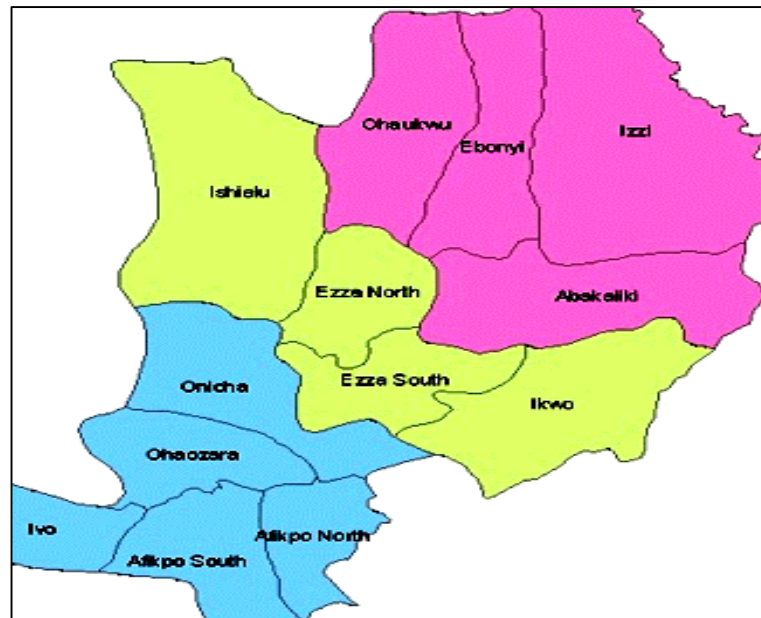


Figure 1: Map of Ebonyi State Showing the Area of Study

Major raw materials in all sectors of their industries. Nigeria as a developing nation should not depend only on oil and its associated products. The nation's economy demand therefore, a through and adequate scientific knowledge of the chemical, mineralogical and ceramic properties of the vast clay deposit of our country.. There are very few brick industries in Nigeria that is still in existence or in full operation. This is due to inability to understand the structural geology of clay, stratigraphy and its physical and chemical components and its geological origin and their vast industrial applications.

The type of Unwana, thick bodied or structural clay products are generally unpopular with the Nigeria building industries because of apparent ignorance of their use. The only processed structural material commonly developed by the Nigeria construction industries come from limestone or marble as cement.

2. Types of Clay

Clay minerals are usually classified according to their origin, chemical and physical properties, uses or combination of any or all of these. We have high grade clays such as kaolin, ball clay, flint clay etc. which are normally used in the manufacture of pottery, porcelain and refractory wares. The low grade clays such as loss, glacial, gumbo, fullers earth, etc. are mostly used to produce structural clay products such as vitrified bodies and different types of ceramic bricks.

3. Methodology

Samples of clay minerals were collected from three different locations in Akanuibia federal polytechnic, one for medical center department, one from new faculty of Environmental sciences, and one from the student's hostel. These were collected at a depth of 70 feet during various boreholes drilling within the campus, and analyzed. The specimens were dried, crushed, and then sieved. The pressed samples were of 26 mm diameter and about 2.5 mm in thickness. The soil samples were crushed (using a mortar and pestle) to their powdery forms. Fine aggregates were graded using sieve sizes. The cumulative mass of dry crushed samples used for the sieve analysis was approximately 400 g. About 50 g of each specimen was weighed and put into a conical flask which contained 50 mm of hydrogen peroxide as a catalyst. The mixture was properly stirred and then placed into a 1000 mm measuring cylinder containing deionized water. The solution was again stirred for 30 minutes and left to stand for another 20 minutes after which the percentage mass of solute was determined after every 15 minutes for a duration of 12 hours.

The densities of the samples were determined using a simple weighing method. The porosity of the materials was obtained using the ASTM C373 (American standard of testing material) test method

4. Results and Discussion

Green properties of Unwana clay samples indicated that water of plasticity varies from 17.75 to 28.21 percent. Most of the rock formations underlying the Unwana area are rich in argillaceous rocks of sedimentary origin. The formation range in age from Albian to Miocene and comprises of clay and shales of different description and varying qualities due to its discovered high percentages of refractories (SiO_2 and Al_2O_3) and low qualities in fluxes MgO , K_2O , CaO , Na_2O and TiO_2 . These chemical components make unwana clay units adequate for producing the refractory substance of the low grade cadre. Anyone clay from laboratory analysis done in ceramic and glass industry department of Akanu Ibiyam Federal Polytechnic has shown that the clay units can produce low-duty to medium-duty to high duty to super duty- refractory substances.

They contain montmorillonite or elite as their major clay minerals. The analysis carried out showed that some units of Unwana clays within the federal polytechnic contain well-crystallized kaolinite and contains SiO_2 in the form of free silica in amounts varying from 8-35 1%. Chemicals tests show that the clays are high in refractors and corresponding low in fluxes.

The disks made from Unwana clay burns to white shale. This clay deposit is of high grade and is suitable for the manufacture of pottery and porcelain, chemical porcelain, dinner wares, art products and refractory bricks and most of all paper production. The laboratory analysis and geological test carried out also indicates that the clay could be used to produce low-grade structural clay products (Vitrified clay bodies) such as sewage pipe roofing tiles, conduits etc. and also non vitrifying clay wares (construction bricks) like ornamentals and paving bricks. The brighteners are characterized by attractive reddish colors. The entire test conducted show that Unwana clay can be used or employed for a wide range of ceramic wares and materials.

5. Conclusion

Cement is at present the only materials uses for all forms of building and civil engineering construction in Nigeria. There is a need to diversify the use of construction materials in the Nigeria construction and building sector of the economy such as bricks.

The result of the Unwana clay investigation, laboratory analysis has proved beyond reasonable doubts that the material can be employed for a wide range of ceramic wares to produce low grade structural clay products (vitrified clay bodies) Such as sewage pipes, roofing tiles, conduits etc. and also non vitrifying clay wares (construction bricks), ornamental and paving bricks

6. Recommendation

Federal, state and local government should employed the knowledge of geologist, and ceramic scientist for a detailed and extensive research within the Alkanu Ibiyam federal polytechnic, Detailed geological mapping of clay deposit, should be embarked upon, pilot boreholes should be drilled within the school premises with sole aim of obtaining geological information, comprising of the area spread extent of the clay deposit, its lithologies, body thickness, the quantity and quality of their deposits. This scientific investigations will show if such precious industrial raw material is actually in a commercial quantities within the premises.

Ceramic and glass technology department should be empowered and encourage to partner with external bodies for full blown clay geo investigations, and productions. The department will end up to be the commercial nerve centre of the Akanu ibiam federal polytechnics amongst other entrepreneur services.

7. References

1. Akpokodje EU, Etu-Efetobor JO (1987). The occurrence and Economic potential of clean sand deposits of the Niger Delta. *J. Afr. Earth Sci.*, 6(1): 61-65.
2. Dobrin MB (1960). Introduction to geophysical prospecting 3rd Edition McGraw Hill NY, pp. 569-582.
3. Milsom J (1992). Field Geophysics – A handbook of Geophysical Society of London Publication Wiley NY, pp. 19-59, 73-97, 161-175.
4. Ogbukagu IK.N(1975)The properties of a cretaceous Refractory clay (Mamu Formation)in Nigeria, *Cahiers Geologiques*, No 95pp300-309
5. Okeugo C.O, Nwabinele, E.O (2012). Production of insulating Bricks using Unwana Clay, Edda clay, Kaolin and Wood Dust. *The International Journal of Engineering and science (IJES)* vol 1., 2(2):184 -187.
6. Okwueze EE, Mbipom EW, Ezeanyin VI, Okon- Umoren OE (1991). Electrical logging of a borehole in a sandy aquifer for groundwater resources evaluation *Pub. Stygologia*, SPB Academic Publishing by the Haque, 6(1): 3-9.