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**INVESTIGATION OF THE PHYSIO-MECHANICAL PROPERTIES AND  
SUITABILITY OF BRICKS MADE FROM OVIA RIVER CLAY FOR USE AS  
REFRACTORY LINING**

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**ABSTRACT**

*The research was carried out to investigate the viability of Ovia River clay for the production of refractory bricks and the suitability of such bricks for use in heat treatment furnace with operational temperature range of 800<sup>0</sup>C to 1000<sup>0</sup>C. Inappropriate production and use of the bricks often lead to failure in these facilities while in operation. Furthermore, majority of refractory bricks used in Nigeria are imported despite the abundance of the major natural resource which is clay. Clay was sourced from Ovia River and processed in combination with other bulk materials aggregates such as sand, refractory cement and water to produce test bricks which were tested for their materials properties. Critical characteristics such as thermal and mechanical characteristics of the Ovia clay bricks which were significant in service were investigated. Tests conducted included bulk density, slag attack, thermal shock resistance, refractoriness, porosity and shrinkage test. Results showed that; the test bricks had bulk densities between 1% and 1.8%. The minimum and maximum values for apparent porosity were 9% and 21% respectively, while loss on ignition were 1.4% and 11.8%. Maximum Cold crushing strength was 150kg/cm<sup>2</sup> at firing temperature of 1200<sup>0</sup>C, Shrinkage test of the bricks showed minimum value of 1.9% and maximum value of 4.8%. The slag attack resistance of the bricks was very good, the thermal shock resistance under high temperature of over 1400<sup>0</sup>C and 10 cycles met the ASTM recommended 10 cycles for good refractory bricks. The bricks reached a high duty range pyrometric cone equivalence (PCE) of 1580<sup>0</sup>C. Results of the tests met the ASTM standards for refractory bricks bulk density range of 1.7% -2.3%, CCS of 59MPa, shrinkage not more than 10%, apparent porosity of 10-30%, and high duty range PCE. It was concluded that Ovia clay is viable for the production of refractory bricks for use in heat treatment furnace.*

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**Keywords:** Brick lining, Furnace, Heat, Ovia Clay, Refractories

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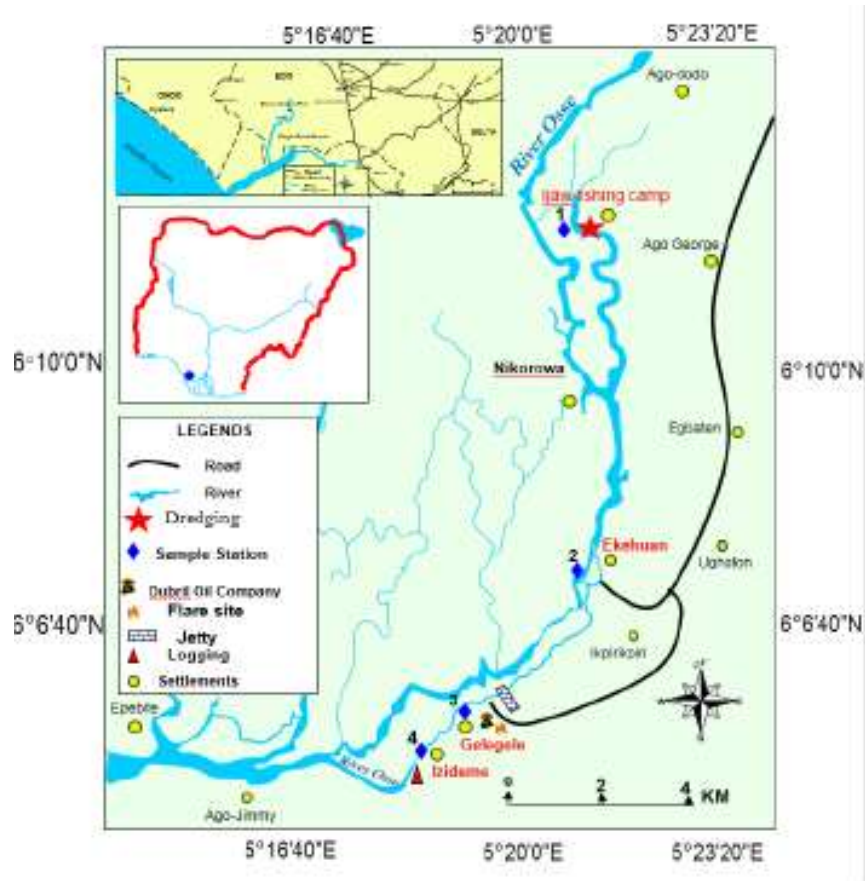
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## **1.0 Introduction**

Clay material is a natural earth composite found in many parts of Nigeria. The clay body in Nigeria is a significant source of material for pottery, thermal facilities, domestic wares, building structures. The viable use of clay is hinged on many of its characteristics amongst which is its very fine grain matter which exhibits plasticity when wet and can be transformed to a hard mater under heat making it a potential refractory material. Refractories are materials that can withstand heat at high temperature and contained alumina ( $\text{Al}_2\text{O}_3$ ) and silica ( $\text{SiO}_2$ ) to form a group of alumino-silicate fireclay bricks; Refractory brick materials are inorganic, nonmetallic, porous and heterogeneous materials composed of thermally stable mineral aggregates, a binder phase and additives. The use of refractory bricks for incinerators, kilns, furnaces and other thermal facilities play a major role in the operational efficiency, durability and structural integrity of the facilities. The majority of existing and operational thermal facilities are imported and made with foreign refractory materials (Etukudoh et al, 2016). This makes their periodical maintenance costly and time wasting in sourcing the foreign bricks where there is need to re-line the kiln. An understanding of the characteristics of bricks made from a typical clay source and the proper selection of local materials for the production of refractory brick locally can solve these problems of dependence on foreign made refractory bricks, ease maintenance mitigate failure in thermal brick lining of furnaces as well enhance the production of furnaces. The ability to produce thermal facilities with refractory linings locally will be a good alternative to maintenance of already failed existing foreign furnaces.

The principal raw materials used in the production of refractories are: the oxides of silicon, aluminum, magnesium, calcium and zirconium and some non-oxide refractories like carbides, nitrides, borides, silicates and graphite, (Bhatia, 2012). However; following various studies that have been carried out, the various chemical constituents found in clay in various regions may vary in composition and amount depending on their natural state of formation. The use of clay may be in its crude state, beneficiated form or as a finished product depending on the needs of the large body of users which include the pharmaceutical, foundry, ceramic, textile, oil and gas industries amongst others (Abuh et al, 2014). Various clays sourced from different regions in Nigeria have been investigated and used for the production of refractory bricks whose physio-mechanical properties were further studied to ascertain their suitability for use as refractory insulation bricks.

Researchers over time have strove to study and categorize these clays and their suitability for use for bricks types as sourced from different regions of Nigeria. The lack of understanding of the efficacy of some clay source for refractory bricks production and the improper use of such bricks in facilities for which they are not suited often lead to failure of such facilities. Many clay sources in various regions of Nigeria may still not have been properly or not yet studied for their characteristics and potential for use in the production of refractory bricks for suited facilities. One of such clay body is that found in Ovia River. The Ovia River is located in the Ovia North- East local government area of Edo State, within the tropical rainforest belt in the southern part of Nigeria. It lies between latitude  $5^{\circ}90'$  -  $6^{\circ} 60'$  N and longitude  $5^{\circ} 18'$  -  $5^{\circ}23'$  E shown in Figure 1.



**Figure 1 Map of Ovia River location. Source: Google Map**

The river which serves as a source of water, fishing and farming for the host community has an annual hydropower potential of 61. 619 MW (Emeribe et al., 2016). The present study is required to explore our natural clay and refractory bricks made from it, which have been under-utilized but are otherwise imported from outside the country. Nigeria spends about five billion naira annually in the importation of ceramic products made from clay (Abuh et al, 2014). This can be mitigated and reversed in favor of self-sustenance and dependence on our rich natural resources by such study.

Isibor et al (2016) carried out a study on the analysis of heavy metals and total hydrocarbons in water and sediment at specific stations of Ovia River of Edo state in a given period. Their study was focused on the effect of natural and manmade perturbations on the heavy metals formations in the water and sediments. Samples analyzed for heavy metals and total hydrocarbons showed that manganese (0.947), copper (0.883) and zinc (0.817) had significant Varimax rotated matrices; hence they were the active components in the water, while copper (0.896) was the only active component in the sediment.

Samad et al (2021) carried out a research study on refractory bricks developed from locally sourced red clay and glass sand. The compressive strength of the bricks developed by adding a range of materials with red clay in different proportions was measured. The authors asserted that it was found that the brick containing 30% white Portland cement, 10% glass sand and 60% red clay had the highest compressive strength of 36.20mpa. The suitability of the of the refractory bricks was evaluated by examining their physical and thermal properties which

revealed they were suited with refractory requirements such as low water absorption (4.58%), moderate apparent porosity (13.32%), preferable bulk density (2.64 gm/cm<sup>3</sup>), less linear shrinkage (3.10%), thermal conductivity (1.3W/m.K), thermal shock resistance (15 cycles), refractoriness, (1408<sup>0</sup>C).

Abere et al, (2020) investigated the properties of fire bricks made from kaolin and silica addition to zircon sand. Their aim was to investigate the suitability of the bricks for use in heat furnace lining. The result of their research showed that the different mixed samples had X, Y and Z had; porosities of 13.5%, 18.3% and 12.6% respectively, bulk densities of 3.2, 2.0 and 1.8g/cm<sup>3</sup>, cold crushing strength of 25.5, 23.4 and 18.8 MN/m<sup>2</sup>, firing shrinkage of the samples was 4.5%, 5% and 6.5% , thermal shock resistances of the samples were 26, 20 and 22 cycles and the samples refractoriness were 1600<sup>0</sup>C, 1580<sup>0</sup>C and 1610<sup>0</sup>C respectively. The authors concluded from their research that the addition of kaolin and silica in appropriate proportions to zircon sand improved the refractory properties of the zircon sand which makes it suitable for fire bricks production and furnace lining.

Ochieze and Esezobor, (2018) studied the performance evaluation of refractory bricks produced from Osiele and Ikorodu clays blended with Azara-Lafia zircon. Their result showed that the clay samples belonged to the family of alumino-silicate and semi-acid refractory since the alumina value fell within the classification of the standard value range of 25-45% (Gupta, 2008). The presence of impurities in alumino-silicate refractory, such as, Fe<sub>2</sub>O<sub>3</sub>, K<sub>2</sub>O, MgO, lowers the refractoriness and service limit of the bricks. The authors believed that silica content above 46.5% indicated free silica which is a major constituent of clays, enhanced the strength of refractory materials.

Osaremwindu and Chukwuma (2014), carried out a research on the performance evaluation of refractory bricks produced from locally sourced clay deposits in Oghara, Ekpan, Ubeji and Jeddo of Delta state Nigeria. The bricks were tested for shrinkage, bulk density, Loss on ignition, cold compression strength, apparent porosity, and thermal shock resistance. Their findings showed that kaolin deposit at Oghara was the best material suitable for the lining of the walls of the highest thermally operated equipment as the expected operational temperatures of most of them are below 1200<sup>0</sup>C. The Oghara deposited clay had a bulk density, porosity, cold compressive strength, shrinkage, loss of ignition, slag resistance of 1.74g/cm<sup>3</sup>, 31.44%, 100kg/cm<sup>2</sup>, 5% and 12.18% respectively. It was found to be less dense, contains more porosity, and possesses low iron content and higher refractoriness with fusion temperature above 1200<sup>0</sup>C. The researchers also asserted that the Ekpan clay was also suitable for medium thermal application in furnaces, kilns and stoves, while the rest could be benefited to improve on their insulating properties.

## **2.0 Materials and Method**

Materials utilized were sourced locally and the method of the fire brick preparation as in accordance with standard practices as follows;

## 2.1 Sample collection and treatment

Clay sample was gotten from Ovia river in Ovia North East local Government of Edo state. Other aggregates materials needed for the preparation of samples include white sand, refractory castable, distilled water, hoe, shovel, drying oven, mortar and pestle, cubic mold measuring (100 x 100 x 100) mm, rectangular cuboid measuring (100 x 50 x 50) mm, pulverizing machine, grinding machine, mechanized mixer, rammer, sieves, heat furnace, electric digital balance, hydraulic press machine, cold crushing strength machine, and pyrometer. The clay and sand samples were sun dried in open air to remove moisture. On drying the clay samples which were in large lumps were hand crushed to smaller sizes using hammer. This was to enhance its eventual grinding into fine powder with a grinding/pulverizing machine. Test samples of the specimen were later oven dried in batches at temperature of 900C thereafter which they were spread out in a secluded open space to cool for enhanced and total removal of moisture.

## 2.2 Refractory bricks production

The test samples of sand and clay were sieved to fine particles grade of 50 micro meter and then mixed with 8 – 20% by weight of water to form a homogenous paste or plasticized mortal. 8% -20% of water as used in the test specimen preparation was determined as the optimum range to achieve plasticity of the mortar as reported by (Niggay et.al 2018, Osaremwindia et al, 2016). Sand and clay were mixed in that order and varying ratios as shown in table 1. The mix were cast into bricks using the steel cubic molds which were lubricated. The test bricks were prepared from various sand/clay mix ratios labelled samples in Table 1. Four samples of the mix (p, x, y and z) did not meet the grade after preliminary testing. The remaining samples 1, 2, 3, 4 and 5 met the grade for further investigation

**Table1 test samples of prepared refractory bricks**

Test samples	p	x	1	2	3	4	5	y	z
Sand/clay mix ratio (% wt.)	10/90	20/80	30/70	40/60	50/50	60/40	70/30	80/20	90/10
Initial observation on plasticity, stability on drying	poor	Poor	Good	Good	Good	Good	Good	Poor	Poor
Remarks	No	No	Yes	Yes	Yes	Yes	Yes	No	No

for every use for ease of de-molding. During the bricks casting, the plastic pastes mixes were poured into the mold and rammed using a 10kg rammer. The molds with the mortal content were vibrated using mechanized vibrator to ensure no voids were present in the mix or bricks. The formed bricks were thereafter removed from the molds after setting and allowed to dry in air for 24 hours before subjected to thermal drying using an oven. Prepared samples of the bricks are shown in Figure 2.



**Figure 2 test sample bricks prepared from ovia river clay deposit**

The prepared samples were dried in a furnace oven at a temperature of 110°C to ensure further removal of moisture through evaporation. The bricks were fired again in a furnace with incremental temperature increase of 100°C at 10 minutes' interval until a peak temperature of 1100°C was attained. The test samples were left to remain in the oven at the peak temperature to soak for 6-8hrs and allowed to cool for another 24hrs inside the furnace before finally removed for test analysis.

## **2.3 Evaluation of Refractory Bricks**

### **2.3.1 Cold crushing strength**

The cold crushing strength is defined as the amount of load that the refractory brick material could withstand after it has been fired to a temperature of 1200°C. To determine the cold crushing strength (CCS) of the refractory bricks test samples Hydraulic load was applied on the brick until the test piece failed to support the load The maximum load at which each of brick failures was taken as the crushing load. The cold crushing strength (CCS) was expressed as

$$CCS = \frac{\text{load at failure of brick}}{\text{Area of surface brick}} \quad (1)$$

### **2.3.2 Bulk density test**

The bulk density test involved the fired bricks of same dimensions of (100 x 100 x 100) mm air dried for 24 hours and oven dried at 110°C before being cooled in desiccants. After drying, the bricks were weighed within the accuracy of 0.008 dried weight ( $w_1$ ) variation. They were transferred to a beaker of water and heated for 30 minutes to aid the removal of entrapped air before cooling and weighed for their wet weight ( $w_2$ ). The bricks were then suspended in a beaker of water placed on a weigh balance and the suspended weight ( $w_3$ ) was recorded. The bulk density BD of the bricks was expressed as

$$BD = \frac{w_1 \sigma}{w_2 - w_3} \quad (2)$$

Where;  $\sigma$  = density of water = 1g/cm<sup>3</sup>

### **2.3.3 Apparent Porosity ( $P_a$ )**

The bricks were oven dried at 110°C until a constant weight ( $w_1$ ) with an accuracy of 0.1grams was achieved. The dried bricks were suspended in 5000ml beaker of distilled water and boiled for two hours. The beaker and its contents were allowed to cool down to room temperature and the new weight(s)  $w_2$  were determined. The bricks were removed from water weighed again in

air to get weight  $w_3$ . The apparent porosity ( $P_a$ ) and water absorbed ( $A_b$ ) by the bricks was determined with the equations 3 and 4 respectively.

$$P_a = \frac{w_3 - w_1}{w_3 - w_2} \times 100 \quad (3)$$

The percentage water absorbed ( $A_b$ ) is given as;

$$A_b = \frac{w_3 - w_1}{w_1} \quad (4)$$

Where;  $w_1$  = weight of fired specimen,  $w_2$  = weight of fired specimen in water,  $w_3$  = weight of soaked specimen suspended in air

### 2.3.4 Thermal Shock Resistance Test

The test process involved the various test specimens of the refractory bricks being dried, placed in a heat furnace and heated at the rate of 5°C/min until the furnace temperature peaked at 1400°C. The bricks were soaked in the furnace at the peak working temperature for 30 minutes after which they were removed with a pair of warmed tong. The bricks were then placed outside of the furnace in a cold environment and allowed to cool down for ten minutes after which they were reintroduced inside the furnace for another 10 minutes. The cycle was repeated several times and were periodically immersed in cold water for rapid cooling until thermal crack could occur

### 2.3.5 Loss on Ignition Test

The loss on ignition (LOI) was carried out after firing with a heat furnace. LOI is the percentage loss of the total weight of the brick after firing. To determine this, the weight of the brick samples was taken before and after firing and the difference between the two weights was taken as the lost weight which was now expressed as a percentage with respect to the total weight before firing. The loss on ignition (LOI) at a given temperature was determined as

$$LOI = \frac{w_1 - w_2}{w_1} \times 100 \quad (5)$$

Where;

Where:  $w_1$  = Initial weight of brick before firing,  $w_2$  = weight of brick after firing

### 2.3.6 Slag Attack Resistance Test

This test was carried out on the bricks to ascertain the effect of slag on its surface during firing, a condition that is likely during service in incinerators and metal melting furnaces. To carry out this test, holes were drilled on the bricks and packed full of iron slag. The bricks were then heated to a standard temperature of about 1300°C and maintained at this temperature for a period of one hour after which they were cooled, sectioned and examined to observe the degree of attack and slag penetration

### 2.3.7 Shrinkage Test

Bricks that were also prepared and cast into rectangular shapes of dimension (100 x 50 x 50) mm in a mold and compacted under a hydraulic pressure of 300 - 350kN/m<sup>2</sup> were used in this test. A straight groove of length ( $L_1$ ) 100mm was scribed diagonally on each brick. The test pieces were then placed inside the furnace and fired up to 1000°C after which the length ( $L_2$ ) of groove on the bricks were measured again. The linear shrinkage of the materials was determined as

$$\text{Linear shrinkage} = \frac{l_1 - l_2}{l_1} \times 100 \quad (6)$$

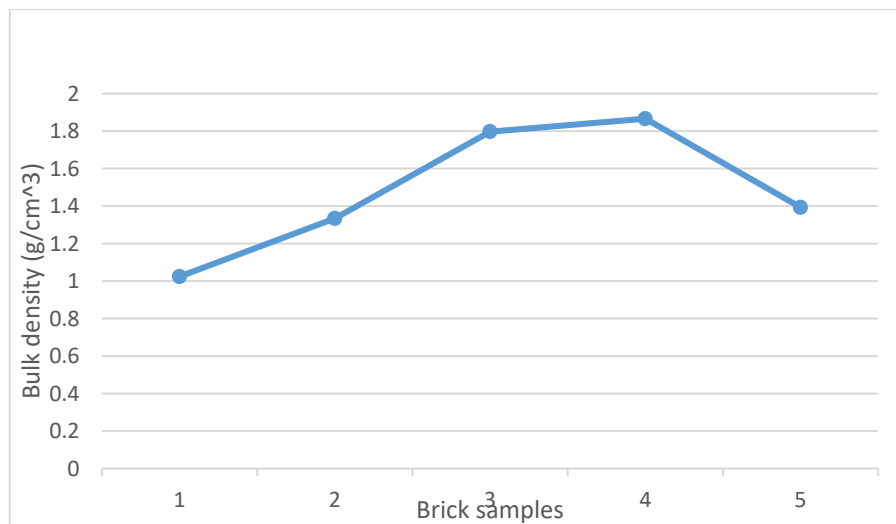
### 2.3.8 Refractoriness Test

Refractoriness of a brick is the fusibility of the material of the brick and it indicates the temperature at which the material softens. The refractoriness of a clay sample is directly related to its softening temperature and is expressed as its Pyrometric Cone Equivalent (PCE). Pyrometric cone equivalent is the number which represents the softening temperature of a refractory cone specimen of standard dimension (38 mm vertical height and 19mm triangular base) and composition

## 3.0 Results and Discussion

### 3.1 Bulk Density

From the graph in Figure 3.1 the bulk density of the samples with composition mixture of 60% silicon and 40% alumina and 50% alumina and silicone respectively were observed to be  $1.8\text{g/cm}^3$



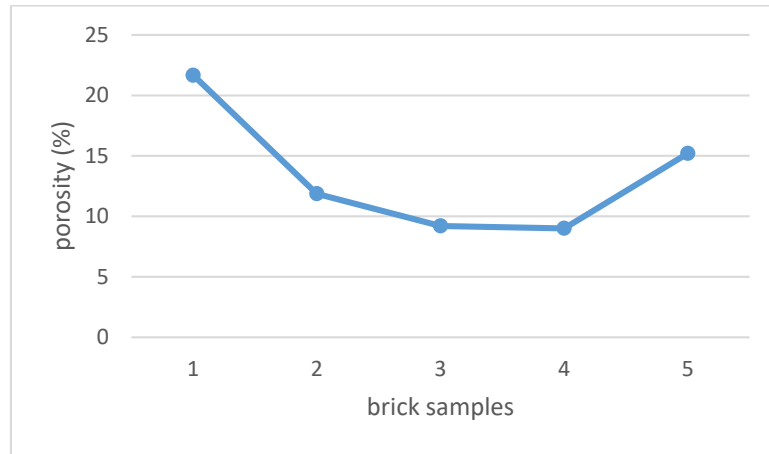
**Figure 3.1 bulk densities of refractory bricks**

The bulk densities of the samples ranged between  $1\text{g/cm}^3$  and  $1.9\text{g/cm}^3$  at sintering temperatures of  $1200^{\circ}\text{C}$ . were in agreement with that recorded by (Aberer et al, 2020; Samad et al, 2021). Bulk densities of refractory bricks in effective operation range between  $1.6\text{g/cm}^3$  and  $2\text{g/cm}^3$  Chester, (1983), ASTM (1984). The sample A had the least bulk density of  $1.02\text{g/cm}^3$ .

### 3.2 Apparent Porosity

The apparent porosities of the refractory brick samples shown in Figure 3.2. was observed to range between 9% and 21% among the prepared test brick samples. Bricks samples with higher clay mix of 70% in the total mixture of clay, sand, refractory cement and water had the highest porosity of 21%. According to ASTM standard, the maximum porosity ranges between 45% - 70% as recommended for good insulating firebricks. All samples tested were lower than the recommended porosities making them suitable for high heat insulation.



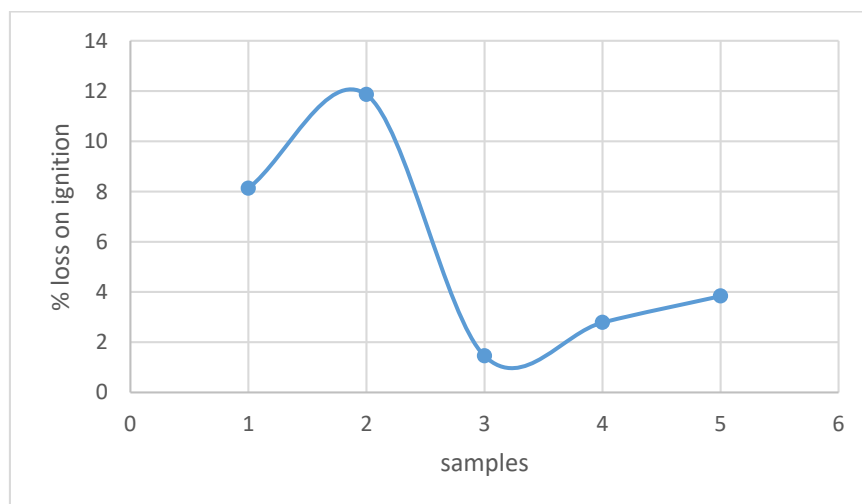


**Figure 3.2 apparent porosities of refractory bricks**

Refractory bricks with higher porosities are better used as secondary liners as they are susceptible to slag attack and liquid or gas penetration which may lead to spalling and eventual break down. Apparent porosities reduced with alumina contents because the pores are reduced as a result of the binding effect of alumina which reduces the inter-particle distances between the grains, Osaremwinda and Abel (2014).

### 3.3 Loss on Ignition

The Loss on Ignition of the Refractory bricks (LOI) was determined as the percentage of moisture and volatile material loss to ignition on firing the prepared clay samples. This is often a representation of the amount of moisture and volatile materials the constituent material of the bricks could hold or the percentage weight reduction of samples before and after firing as shown in the graph in Figure 3.3.



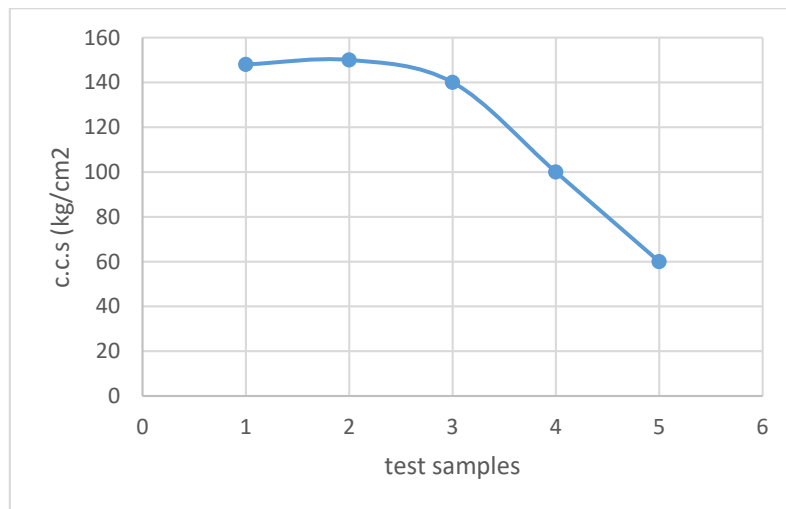
**Figure 3.3 Graph of Loss on ignition test of refractory brick**

The LOI may be dependent on the micro-structural arrangement of the material particles such as the finesse of the particles and particle spacing which allows for the ease of escape of moisture and volatile materials. The LOI for test samples of the bricks was between 7.85% and 12.8%. Lower LOI recorded in test samples may also be due to the loosely packed grains

which allowed the absorption of moisture prior to firing. Viera et al (2008) asserted that Loss-on-ignition is an indicator of the amount of carbonaceous matter and carbonates present in the clay. In other words, a low loss-on-ignition indicates that the amount of carbonaceous matter and carbonates in the clay is low. Carbonates found in clay are mostly magnesium, iron and calcium carbonates, which are often regarded as impurities and could be formed from high contents of the metals in the clay which may have resulted in the pattern of loss on ignition observed from the test brick samples with higher clay ratio and higher LOI.

### 3.4 Cold Crushing Strength

The cold crushing or compressive strength of the test samples refractory bricks is shown in the graph in Figure 3.4. It was observed from the graph that at the firing temperature of 1200<sup>0</sup>C the test sample with silica/clay ratio of (40/60) % had the highest compressive strengths of 150kg/cm<sup>2</sup>. Lower values of CS were observed in test samples with silica ratio above 40% and clay below 60% mix. this may be due to the sintering of the bricks at the firing temperature with alumina having a greater influence in the sintering of the bricks. Sintering augments the bonds between the particles and therefore strengthens a powder compact. In all cases this occurs because atoms of a particle in contact become intermingled, Onyekpe, (2002). This may also be alluded to particle sizing of the clay and sand aggregate. Finer grain particles may exhibit better fusing strength hence; the clay grain particles possessing finer grains will exhibit better cohesive forces compared to the sand grain particles. Compressive strengths of bricks are often an indication of better stability against dynamic and static loads.

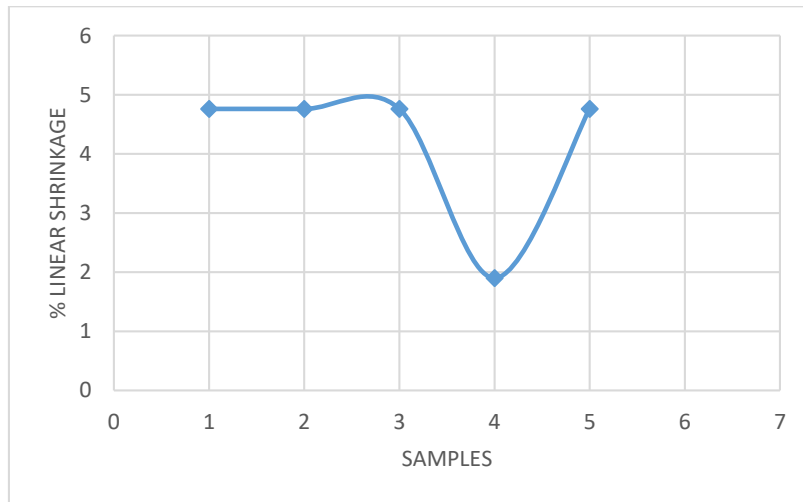


**Figure 3.4 cold crushing strength of refractory bricks test samples**

The stacking of refractory bricks during lining of furnaces subjects them to loads and under service conditions where they are subject to high temperatures from the burning flame or heat, the strength becomes of advantage as they remain rigid and resistant to impacts of explosive objects as is commonly experienced in incinerators. The cold crushing strength, which is considered by some to be doubtful relevance as a useful property, other than it reveals little more than the ability to withstand the rigor of transport. It can be seen as a useful indicator to the adequacy of firing and abrasion resistance in consonance with other properties such as bulk density and porosity. Bhatia, (2014)

### 3.5 Shrinkage test.

The shrinkage test as shown for the various test samples in the graph in figure 3.5 showed that it was highest at 5% for test samples with relatively higher clay (alumina) content and about 1.9% for the test samples with higher silica.



**Figure 3.5 Linear shrinkage of refractory bricks test samples**

While various reasons may be attributed to shrinkage of refractory bricks, the order of shrinkage of the test samples as observed from the graph in Figure 3.5 may not be unconnected with the high moisture and volatile material contents of samples with high clay ratio mix. There is also a possible effect of inter particle spacing which allows for the lateral movement of the particles and moisture removal. Such phenomenon may close the spaces with a consequential decrease in the marked diagonal. While it is desirable that all these changes are effected during manufacturing, it is not possible due to economic reasons, as the process is time dependent. Permanent Linear Change (PLC) on reheating and cooling of the bricks give an indication on the volume stability of the product as well as the adequacy of the processing parameters during manufacture.

### 3.6 Slag attack resistance

From the slag attack resistance test result of the various samples of refractory bricks. It was observed that the samples with relatively close clay(alumina)/sand (silica) ratio showed better resistance to slag attack. This is predicted to be attributed to the tightly packed adhesive forces between the particles clay and sand fine grains with a moderate mix of alumina and silica. The internal surface conditions of the bricks after firing showed no significant corrosion and spalling. However; the brick samples E and F showed signs of flaking in varying amounts. The tight fusing of the fine materials particles and hard surface achieved from proper vitrification of the brick may be attributed to the resistance of the brick to withstand slag incursion and wear on the surface; a significant phenomenon encountered in heat furnaces such as incinerators and smelting furnaces where slag, gasses, and high velocity moving particles impinge on the internal surface of the refractory lining bricks.

### 3.7 Thermal Shock Resistance

From the thermal Shock Resistance test result, brick samples with moderately close alumina/silica ratio after being subjected to various rounds of heating, were observed to exceedingly withstand high temperature cycles spanning over 10 cycles at temperatures exceeding 1400<sup>0</sup>C. Following the ASTM (1984) recommended 10 cycles test for good recycle bricks, it was therefore concluded that the brick except the ones with excess clay (alumina) and excess sand (silica) at over 60% each were sound enough to be used in furnace or kilns at higher temperatures. However; at higher temperatures above 1400 0C, when the bricks were suddenly cooled to lower temperatures by immersing in cold water while still hot, the test brick samples with good thermal shock resistance showed no significant changes in structure unlike the brick samples with excess alumina and silica which started to gradually wear out and spall at 1301 0C. At both ends of the mix where alumina or silica was in excess degradation is noticed maybe due to weak cohesive forces within the brick grains compared to the stronger adhesive forces between the moderate mix of alumina and silica which more or less can be assumed to be a reinforcement of the bricks with external materials. Theoretical support of the thermal shock resistance of the bricks in the manner they did may be offered by the analytics of Lu and Flek (1998) who asserted that It is generally accepted that the thermal shock fracture resistance of a material depends on a number of material properties including the thermal expansion coefficient thermal conductivity k, thermal diffusivity k, elastic modulus E, fracture toughness KIC, tensile strength sf, and upon the additional parameters of heat transfer coefficient h, specimen size H, and duration of thermal shock (which is often overlooked).

### 4.0 Conclusion

The result of the physical and mechanical strength investigation proved that the Ovia clay sourced from River Ovia in Edo state has potential for possible use in the production ceramics, oil drilling, refractory bricks production etc. The view was reached because values of the various mechanical tests carried out on the clay bricks were in close agreement with recommended standard values by ASTM standards. The high duty range PCE of 1580<sup>0</sup>C suggests that the bricks can be adapted for diverse use in thermal facilities considering the temperature capacities which exceeds service temperatures of many thermal facilities with operational temperature range of 800 to 1000<sup>0</sup>C. The bricks with lower density and or high porosity will be suitable for use as insulating bricks. The understanding of the mechanical properties of the bricks made from Ovia clay as explored in this work clearly reveals a lot about the clay which before now had limited research documentations on its physio-mechanical properties.

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