Clay, Clay Bodies and Strength: The Example of South-Western Nigeria

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ABSTRACT

Clay, the main studio and industrial ceramic/sculpture material has been scholarly studied in origin, types, physical and chemical values, strength and capacities. Scholars outside Africa approach to the study of clay however, where based on their local origin of clays and experience. Names of clays, locations and origin for different types are often Eurocentric and strange to many African artists who are not familiar with the latter. Yet, their publications remain essential instructional materials for ceramists/sculptors in Africa. This factor underscores the clear scientific understanding and workability of African local clays. As a result of this inhibition, studies on clay generally have been made in this study; with focus on Southwestern Nigeria. The zone is being highlighted here, because of its rich different clay type's sources and fecundity in ceramic and sculpture art praxes. There types and diverse uses have also been discussed according to their body types and strength. Significantly, the study provides empirical understanding and technical use of the clay material, body preparation and adjustment for ceramists and sculptors who largely use clay for their creative engagement in the zone.

Keywords: Ceramic sculpture, clay, clay body, clay strength, south-western Nigeria

INTRODUCTION

O w'amokoko

Bi kile o damo

(The earnest wish of potters is for earth to be clay).

Ajala, Alamo ti n mori

Mori temi nire

(Ajala, the chief potter that mould head, Mould mine in goodness)

As the clay is in the potter's hand… (Jeremiah 18:6 (KJV).

The three separate poetic statements here applied, provides appropriate definition, hint on the capacity and capabilities of clay. The first statement which is Yoruba maxim literarily and connotatively looks at clay as a type of soil, valuable in the type of functions it can be deployed by potters (ceramists and sculptors). In the second statements, the Yoruba cosmogony and cosmology in the creation of man by *Obatala,* the arch divinity is pontificated and portrayed in genuflect. Here, in intense and utmost devotion, *Obatala* is being placated to mould well physically spirited being; the material which *Obatala;* the Ceramic-sculptor uses, connotatively here, is clay (Kalilu, Akintonde and Ayodele, 2006: 51-52 and Akinde, Woods and Odeniyi, 2008: 535). In the biblical potter's wheel analogy (Jeremiah 18:6 (KJV), clay is also the central focus of the material in reference; use to form man - his physical body in whatever way God wishes (Genesis 2:7 (KJV).

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Why the hermeneutic of the scripture is not the concern of this study, the exegeses of the preceding Yoruba proverbs and invocative prayers suffice it as a good definition and analytical basis for empirical understanding of clay flexibility in the creative art engagement. It is also indicative of the various ceramic possibilities in human endeavours. For instance, ceramic have been used for wide range of applications; beyond its uses for household utensils, sanitary ware and aesthetic objects, ceramics has also been incorporated into architecture, burnt bricks, floor, wall and roofing tiles are common ceramic objects used in architecture in the ancient time (Akinde, Odeniyi and Abiodun 2013: 52-64). Early civilization of the Yoruba, Mesopotamia, Egypt and Persia lavishly used ceramics in their architecture. Still, its uses in human life are more complex. For instance, Ibrahim (2005: 25-35) in his argument observes that the challenges of ceramic material research and development far exceed the application in architecture and building or even interior design or decoration. He stated further:

> "…the dielectric semi-conductive and magnetic characters of certain ceramics are especially valuable to scientists and engineers who design or utilize devices for electric circuits. In certain areas ceramics are at the fore front in industrial design and high technology…. application in space technology – where refractory tile coatings have been used on the external surfaces of the American NASA space shuttles to enable vehicles withstand the elevated temperatures generated by atmospheric friction during re-entry" (Ibrahim, 2005:25-35).

Similarly, Kalilu, Akintonde and Ayodele (2006:20-21) also observes that the space age and indeed the millennium age is undoubtedly the ceramic age. They opined further that ceramics have overtaken metals. Ceramics touches human lives at widely different and diffuse points: toilet wares, synthetic bricks, vases, tiles, kilns, radio-active waste absorbers, spark plugs, blast furnace linings, memory calls electrical insulators, submarines and space vehicles.

Arising from the varying capabilities and applications in human life the increasing need for ceramic objects for domestic uses and its application in modern science and technology; frequent examination of ceramic practicability is indeed important in capacity building. The Nigeria ceramic industry is seriously lacking in capacity and direction. More challenging however, is the over dependency of Nigeria market on importation of ceramic wares in the mist of preponderant ceramic mineral in the country which can be harnessed and processed into ceramic raw materials (Abiodun, Akintonde and Akinde, 2013: 103-111). Giving the large human resources in ceramic fields, that could drive the ceramic industry in Nigeria positively, it is expedient and imperative that effort should be geared toward more researches and onward utilization of research results. This step may turn around the ailing ceramic industry in the country towards self-sufficiency in ceramic. Significantly, this study is a pragmatic step toward gradual revamping of the ailing Nigeria ceramic industry for deserved advancement.

Against this background, good understanding of clay, clay type, body and strength is necessary; identifying them in relation to some local types in the Southwest of Nigeria where clays are used for different ceramic products and applications is equally necessary. It further assesses clay, the basic ceramic raw material, in its simple definition and mineralogy, indigenisation of the art production and possibly in exportation of the product. In this study, advance ceramics which has wide applications in chemistry and mechanics was not studied as it is not the primary concern of our focus. This study in all ramifications does not deal with all areas of traditional ceramics. It is also not a comprehensive study of the areas attempted since the field is wide and multidimensional. Therefore, this study is only an attempt to

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further sensitize the urge to know more about the field and also exhibit dexterously skills towards improved ceramics and sculpture professionalism.

CLAY: DEFINITION

Clay which is a product of geologic weathering has severally been scientifically studied. Rhodes (1998: 6-7), Peterson (1998: 14), Fournier (2000: 64), Ibrahim (2005: 25-35) and Kalilu, Akintonde and Ayodele (2006: 47) have similarly and variously defines clay as a type of soil, mainly of hydro-silicate alumina. Purest clay which is whitish in colour has chemical composition of $Al_2O_3.2S_1O_2.2H_2O$. Other types of clay such as fire clay, adobe clay, earthenware and stoneware clays among others are slightly different in chemical and physical compositions. Ordinarily clay is inert when not subject to physical, mechanical or chemical pressures. At the dry state, it is rock hard but brittle and often composed of disc-like particles, when moist with required water, it becomes plastic and can yield to various forms when it is subjected to kneading. But it becomes active chemically when adjusted with other ceramic and fibre materials; processed for specific function. The physical and chemical reaction of clay continues during drying and when subjected to heat of certain temperature.

Types of Clay and its Local Mines in South-Western Nigeria

Clay basically can be sub-grouped into two based on geologic formation. They are primary and secondary clays. The formation of clay is as a result of weathering processes; mostly of natural forces such as rain and under current water and glacier which percolate cracks, break down the soluble matter of rock into some coarse particle size and gather them at the precinct of the mother rock. Further pressure and erosive processes within the same environment breakdown the rock particles and somehow pulverize them into fine particle structure. The atmospheric moisture and the inter mingling of other organic and inorganic matters soften the whole mass of the rock particles and caused it to become plastic to touch and flexible, to work in some degrees. The product of this type of weathering is known as primary clay.

Primary clay is pure in structure and colour because it has little interaction with other foreign bodies which may affect its chemical composition drastically. It is whitish in colour, coarse in texture and loosely packed. Primary clay is also very hard at dry, high in vitrification and matures at temperature between 1400^{o}C and 1700^{o}C. It is the main ingredient for porcelain body. This type of clay is not wide spread like the secondary clay. There are few areas in Southwest of Nigeria where such clay can be sourced. White clay types are however, available at Ijero Ekiti, Igbara Oke, Igbara Odo and Iwo environs of Ondo, Ekiti and Osun States. Primary clays found across the zone are good for the formulation of porcelain and stoneware bodies and refractory bricks because of its hardness and high heat resistance. Comprehensive studies of the clays are yet to be done to be sure of the purity and general behaviour in ceramic processes. However, some ceramic industries and tertiary institutions mined their primary clay (kaolin) in the aforesaid places across the Southwest of Nigeria while others get their kaolin outside the zone.

In secondary clay formation, weathering proceeds far beyond the base of mother rock causing them to further break into pieces and ground into fine particle size, mingling with organic and inorganic matters before it reached estuary. At the estuary, carbonaceous matters and other foreign bodies also combined with the clay and the action further increase the plasticity invariably and sediment to complete the formation process when the whole mass is up heaved by underground pressure, to some distance and hence varied in colour.

Many of the Secondary clay which is earthenware in nature across the Southwestern Nigeria comes in off white, reddish-brown and gray or black shades and mostly fired to buff-red, and brown of different shades. The colour effects and the high plastic nature of secondary clay is

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due to the heavy presence of metal such as iron-oxide content and different types of organic and inorganic matter associated with the clay in transit during formation. Secondary clay is the most common; it is available almost everywhere, the world over. Different types according to varying geologic formation and associated foreign bodies are found in abundance across the South-western Nigeria. For example, *amo funfun* (off white), a newly formed secondary clay; *amo pupa* (reddish clay), relatively consisting of large amount of iron oxide while *amo dudu* (gray or black clay), a carbonaceous clay. Clays also have different local names across the zone which is relative to their formations, localities, physical appearances and qualities. Traditionally, clay availability or depot usually determines the location of pottery centres in the Southwest of Nigeria (Fatunsin, 1992: 17-19 and Kalilu, Akintonde and Ayodele, 2006: 49-50).

Dada, Akerebiata, Okelele and other pottery centres in Ilorin, Kwara State have and combined at least three types of secondary clay known as *Ogiri amo* (clay wall/off white), a stone body; the *abumole* (black clay) relatively high in plasticity and *ewuyan,* a shining body clay with hard texture. The Erusu clays also found at Aga, Okesan, and Osinna quarters in the town are named accordingly as *amo Aga, amo Okesan* and *amo Osinna;* they are very plastic. The latter however, is applicable to clays found in Igbara Oke and Oke Agbe, all in Ondo State. These clays can be used without much processing. They come in shades of reddish-brown colours when fired. Secondary clay from Igbara Odo, Ekiti State is also similar to the Erusu type in texture and plasticity. Ipetumodu, Mooro, Edun-Abon, Ile-Ife, Ikirun, Iresi, Ikire and Ijabe in Osun State; Ibadan, Iseyin, Oyo, Ogbomoso, Orile-Igbon, Oko and Saki in Oyo State; Yewa, Imoto, Igbogila, Tata, Oke Odan and Ifo in Ogun State; Ikere Ekiti, Ijero Ekiti and Ire in Ekiti State as well as Ikeja, Badagry and Oke Afa in Lagos State have abundant workable secondary clay types. Though varied in types, they all perform excellently when used in ceramic works. The Ipetumodu and Ijabe types fired between 850^{o}C and 1100^{o}C, into vitrification; some however could fire up to 1180^{o}C. Secondary clays are usually mined around the streams, river banks valley and designated clay depots. Other clay depots are discovered courtesy of rural urbanization particularly in the area of borehole and well digging as well as house, road and drainage constructions.

Plate 1
Clay Deposit along Nana Stream,
Atenda Area, Ogbomoso.
Photograph: Segun Abiodun, 2009

Plate 2
Emmanuel Alayande College of Education
at Dapo Art Gallery during Industrial Training
Scheme, mining clay at a road construction site
along Oyo-Ibadan Expressway.
Photograph: Segun Abiodun, 2009

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Also engaged in the sourcing of clays for ceramic purposes are Tertiary Art Departments informally known as Art Schools. Obafemi Awolowo University, (OAU), Ile-Ife and Osun State College of Education, Ila-Orangun have their secondary clays supplied from Ipetumodu, Mooro, Edun-Abon and Ile-Ife environs; Ladoke Akintola University of Technology, Ogbomoso collects her secondary clays from several locations in Ogbomoso, Orile-Igbon, Oyo and Ilorin as well as their kaolin from Iwo; Emmanuel Alayande College of Education and Federal College of Education (Special), Oyo also have their secondary clays supplied from Oyo, Ilora, Fiditi, Akinmorin and Awe environs; Yaba College of Technology, Lagos has her secondary clays supplied from Oke-Afa, Ikeja and other areas in Lagos; The Polytechnic, Ibadan has their secondary clays supplied from Eruwa, Molete, Asejire Dam, Omi-Adio and other areas in Ibadan while Federal University of Technology, Akure collects their clays from Akure, Igbara Odo, Igbara Oke and Ijero Ekiti environs (plates 1 and 2).

Clay Body Type

Clay body refers to specific composition of clay types, and preparation to meet required needs for the production and uses of ceramic objects. Kalilu, Akintonde and Ayodele (2006: 49-50) observe that the two major types of clay are the foundation of three basic types of clay bodies; earthenware, stoneware and porcelain whose maturing temperature ranges between 750^{o}C and 1150^{o}C, 1150^{o}C and 1350^{o}C as well as 1400^{o}C and 1700^{o}C respectively; these clays form the rudiments for other clay bodies. However, clay body formations which are varying from place to place have been documented by the likes of Singer and Singer (1963), Cardew (1967), Rothenberg (1972), Daly (1995), Rhodes (1998), Fournier (2000), Petereson (1998), among others. In South-western Nigeria, composition of clay bodies is not also alien to traditional potters as they usually combines two or more clay types to form clay bodies in their various pottery centres according to their understanding of different types of clays that exist in their localities in order to give more strength as well as colour to their pottery wares during firing (Fatunsin, 1992: 17-19 and Abiodun and Akinde, 2013: 699).

In recent time, there is a lot of clay bodies' composition that were developed in various pottery/ceramic workshop and industries as well as art schools. For instance, certain clay body specification may be for strength or aesthetic especially to achieve physical colour effect such as mattness, transparency and translucency. Clay body type may also be selected to appropriately accept a particular glaze batch on a corresponding body to withstand common glaze flaws such as; crazing, dunting, pine-holing, crawling and running. Physical strength of clay during throwing or making of a big hand built ceramic objects, as well as shrinkage degree considerations are also required. Sometimes, ceramic objects required for chemical use must also be composed of non-corrosive or non-absorbent terracotta and glaze bodies. This type of body is also highly essential for ceramic objects in use for mechanical devices or processes. Other considerations for clay bodies for ceramic object used in optics requirement are light reflective, light transmitting in colour wave length as well as transparency and translucency within ceramic material (Daly, 1995, Rhodes, 1998, and Fournier, 2000). However, some clay body types that are widely used in ceramic studio, art schools, cottage industry across South-western Nigeria are discussed below.

Thrown Body

Clay that is meant for throwing is usually plastic and flexible for firm manoeuvring on wheel. It is essential for thrown body to meet the wheel stress and other desirable effects. In some cases earthenware body may be sufficient to be compose of thrown clay because of its plasticity, however, if a special texture, colour effect or strength are required, some proportion of ball clay (for smoothness), kaolin (for strength and temperature control), earthenware (for low firing) and fine grog (for shrinkage control) may be mixed together to

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achieve any desired result in the type of body intended. For instance, Atamara Pottery Centre at Ikire in Osun State and Dapo Art Gallery, Oyo have developed an earthenware body composed with some quantity of ball and laterite. The colour effect of the clay body gives brilliant reddish brown because of the large quantity of iron in the laterite (plates 3 and 4). While some ceramic cottage industries add some quantity of kaolin to their secondary clays in order to get light red effect after firing.

Plate 3
Raw composition of thrown body consisting ball clay and laterite, Dapo Art Gallery, Oyo
Photograph: Segun Abiodun, 2009

Plate 4
Flower pot product of a thrown body consisting ball clay and laterite, Atamara Pottery Centre at Ikire
Photograph: Segun Abiodun, 2013

Too much water absorbent body may be problematic to use on wheel. The object been formed may be soaked and become too weak to yield to the wheel stress. In other way, a too plastic clay body is apt to high shrinkage at the drying, firing and glaze firing periods. It is therefore necessary to adjust such body with some quantity of kaolin, stoneware clay, fire clay or fine grog to open the body proportional to the required shrinkage level. However, the type and size of the thrown ware will determine the plasticity and smoothness of the thrown clay body. A fine mesh is usually used in sieving clay bodies that is meant for small thrown wares while open mesh, that will allow passage of sand into sieved clay bodies for more strength is commonly used for clay body intended for big thrown wares.

When transparent glaze is required for a thrown object, it is necessary to prepare a smooth clay body that will allow the glaze to fuse very well on the wall of the ware without altering the colour effect. However, body for mat or opaque glazes may not be too smooth as a mild texture of the wall of the object may not significantly affect the glaze and the colour effect intended to be used on the body (Daly 1995: 14-16). Also, a low maturing temperature clay body cannot be used for a high maturing glaze because before the glaze matures the body on which the glaze is fixed would have been over-heated, which is likely to result into body warping or melting of the whole mass. This makes most of the ceramists in Southwestern Nigeria to add kaolin to primary clays that is intended to use for high maturing glazes since majority of these clays have low maturing temperatures.

Hand-Built Body

Clay body for hand-built work should not be as plastic as the thrown body. Except for small ceramics or ceramic sculpture work, the body should not be too smooth for it to be able to

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sustain load pressure as well as to withstand temperature stress across the phases of firing. A more open body composed of earthenware clay mixed with grog, sand and is good for large hand-built pots. For large ceramic-sculpture work and model for outdoor sculptures, a more coarse body is necessary. The need to compose this body is to support the mass and density, compression, strength and shrinkage of the wares during drying and firing processes. The latter exemplified in the highly decorated ceramic-sculpture assemblage pots of Ife Art School otherwise called "Ife wares" (Abiodun and Akinde, 2013: 702) basically for strength, stability and shrinkage control during drying and firing. It is further observed that Ife Art School adopted about ninety percent (90%) of Ipetumodu clay, four percent (4%) of sand (for opening of the body) and six percent (6%) of coarse grog (for shrinkage control and strength) to form over 150cm high pottery/ceramic-sculpture assemblage pillar pots; tradition that is still sustained by prodigy institutions like Ladoke Akintola University of Technology,(LAUTECH), Ogbomoso; Emmanuel Alayande College of Education (EACOED) Oyo and Osun State College of Education (OSCOED) Ila Orangun among others where assemblage pillar pots and ceramic-sculptures are being practiced (plates 5, 6, 7, 8, 9, 10 and 11). The justification for formulation of this body is in line with Fournier (2000: 209) argument that normal shrinkage of clay is usually between ten to twelve percent (10-12%), if it is higher, the clay body should be adjusted with more flint, sand or grog, otherwise, the object being made may eventually lose its form due to excessive shrinkage during drying or firing.

Jigger Jolley Body

The clay body composition for jigger and jolley exercise take cognizance of the machining of the clay into form. The stress that the clay will undergo during machining, dry, shrinkage, firing and glazing processes must be put in consideration. Clay for jigger and Jolley may be composed of earthenware, stoneware, fireclay even porcelain according to the specification required. However, the clay must not be too plastic but it must be dense, ductile, strong and free of air purse to be able to withstand machine manipulation and accommodate itself to a new position as it dries and shrinks to smaller size shrinkage as well as drying stage.

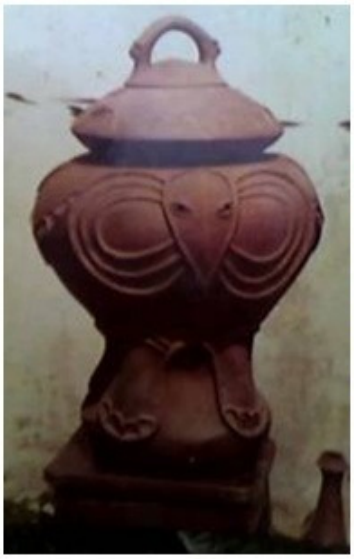

Plate 5. Moses A. Akintonde
A o merin joba,
Hand-built terracotta, OAU, 1983,
Photograph: Artist, 1984.

Plate 6. Toyin E.Akinde
Ori inu, ori ode,
Hand-built terracotta,
Height: 217cm, LAUTECH, 2007,
Photograph: Artist, 2010

Plate 7. Segun O. Abiodun
A o merin joba,
Hand-built terracotta,
height: 228cm, LAUTECH, 2009,
Photograph: Artist, 2012

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Plate 8. Giant hand-built pots at Emmanuel Alayande College of Education, Oyo.
Photograph: Dapo Eyinade, 2011

Plate 9. Final year HND students' hand-built pottery and ceramic-sculptures displayed, The Polytechnic Ibadan,
Photograph: Toyin Akinde, 2013

Plate 10. *Fight of the titan,*
ceramic-sculptureterracotta,
Yaba College of Technology, Lagos, 2013.
Photograph: Toyin Akinde, 2013

Plate 11. *Fatherly love,*
ceramic-sculptureterracotta,
Yaba College of Technology, Lagos, 2012.
Photograph: Toyin Akinde, 2013

Musa Raymond Venture Ceramic Section, Oyo adopted non-plastic clay of about seventy five percent (75%) of powdered clay and twenty five percent (25%) of powdered laterite mixed with a very little water in its production of charcoal stove insulator using jiggering method.

Paper Body (Fibrous)

Clay body for paper clay is usually an addition of some quantity of fibres such as paper, wool, grass, pulp or sawdust to earthenware or other types of clay. Fibre materials that have been beaten to fine substances are usually mixed with plastic clay, porous and pervious to water; the clay is also made to semi liquid in order to mix thoroughly with the fibre

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embedded in it. These additives, usually decrease plasticity and shrinkage but increase green strength in the paper clay body. During firing, the combustible material(s) in the clay burns, yet it retains its shape and the object becomes lighter in weight. It is however used for the production of ceramic sculpture figurines and also for mending crack leather hard wares. However, it is seldom used in the South-western Nigeria.

Adobe Brick Body

Bricks with adobe body are very good insulator. Although they are sun dried and performs well in use. The body type is very simple, clay close to earth surface are mixed with straw, chaff, rice husk, sawdust or other type of fibre, some quantity of water is added to allow proper mix. A typical experimented adobe brick in LAUTECH Art School comprises of sixty percent (60%) of ball clay, thirty percent (30%) of straw, chaff, rice husk, sawdust or other type of fibre and ten percent (10%) of sand. It is then cast in a box mould and sun dried (plate 12). Adobe brick is a good insulator for the exterior part of the kiln, oven and furnaces wall. However, if high temperature firing is required it should not be used. The high iron content of the clay reduces its heat resistance. That notwithstanding, it can support heat temperature between 850^{o}C and 1100^{o}C.

Plate 12. Toyin Akinde kneading adobe brick body, LAUTECH, Ogbomoso
Courtesy: Toyin Akinde, 2001

Refractory Brick Body

Refractory bricks are high heat resistant ceramic insulator brick used for the lining of kiln and furnace. Clay body or body for refractory bricks can be composed of dense and heavy material which could support heat retention and good insulation properties. These types of bricks are used for fire wood and gas kilns which have harsh firing incidents, unlike the electric kiln. Electric kiln bricks are light softer but very effective in heat absorption and insulation.

A typical composition of refractory brick body composed in LAUTECH, Ogbomoso, comprised of fifty percent (50%) of Iwo Kaolin, thirty five percent (35%) of Ogbomoso earthenware clay, ten percent (10%) sawdust and five percent (5%) cow-dong as binder. The brick is dense, firm and fired effectively to 1150^{o}C. Another refractory brick composition in LAUTECH consist of sixty percent (60%) sieved Iwo Kaolin, ten percent (10%) of clay and twenty-seven percent (26%) of sawdust mix with four percent (4%) of sodium silicate; a composition designed to reach about 1250^{o}C. In the body preparation, the mixture was moist with enough water for saturation; it is then left for some days to age before kneading properly

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and rammed into metal moulds of 8.5 x 11.5 x 24cm, 11 x 11.5 x 23cm or 10 x 12 x 22cm depending on what it meant to be used for. It was also allowed to sundry gradually and later fired using gas or wood kiln (plates 13 and 14).

Refractory bricks used by construct the gas kiln for Fine Arts Departments, Emmanuel Alayande and Osun State Colleges of Education were composed of fifty percent (50%) of Kankara kaolin and fifty percent (45%) of sawdust mixed with five (5%) sodium silicate. The marked difference in the latter refractory bricks body is the Kankara kaolin which appears better than Iwo Kaolin in heat resistance between 1300^{o}C and 1400^{o}C.

Plate 13
Toyin Akinde mixing refractory brick body consisting, fifty percent of Iwo Kaolin, thirty five percent of Ogbomoso earthenware clay, ten percent sawdust and five percent (5%) cow-dong, LAUTECH, Ogbomoso.
Courtesy: Toyin Akinde, 2001

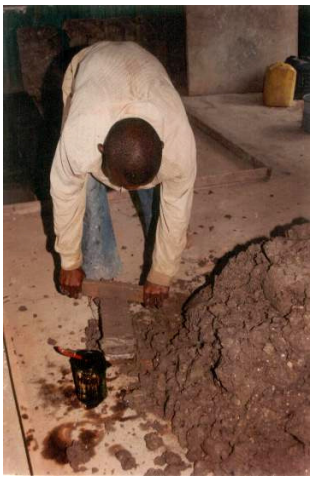

Plate 14
Toyin Akinde was ramming refractory brick body into metal mould during casting of brick.
Courtesy: Toyin Akinde, 2001

Slip Cast Body

A slip cast body is semi liquid clay, prepared to run smoothly in and out of plaster mould during the casting process. Slip viscosity is considered for water absorption by the plaster mould which allows gradual building of thin clay wall on the mould. Good slip body composition will allow a free release of the cast from the mould. Slip cast body composition in the South-western Nigeria is varied because ceramists are experimenting on the types of clay and other ceramic materials that are available in their vicinity based on their plasticity and shrinkage. LAUTECH Art School typical composition of slip body is a mixture of thirty five percent (37%) Ogbomoso/Orile-Igbon earthenware clay, fifty percent (50%) of Iwo Kaolin, ten percent (10%) of fine grog (for shrinkage control) and three percent (3%) of sodium silicate (deflocculant) mixed with adequate water; it is fired up to 1100^{o}C while another composition consists of sixty percent (60%) Ogbomoso/Orile-Igbon earthenware clay and forty percent (40%) of Iwo kaolin. There are other compositions of slip cast bodies experimented by various studios and art schools across the zone basically to control the shrinkage of the cast wares and also to derive various shades of colour after firing (plates 15 and 16). These compositions range from ninety percent (90%) of clay and ten percent (10%) of kaolin to ten percent (10%) of clay and ninety percent (90%) of kaolin while others used hundred percent (100%) of clay or hundred percent (100%) of kaolin with little or no sodium

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silicate depending on the chemical and physical composition of the available clay (Ogunsina 1999: 34-38 and Layiwola 2010:114).

Plate 15. Pouring clay slip into mould, Layiwola's Studio, Ibadan, 2009. Courtesy: Layiwola 2001:154

Plate 16. Two cast heads showing the degree of shrinkage before and after firing, Layiwola's Studio, Ibadan, 2009. Courtesy: Layiwola 2001:114

CONCLUSION

Despite the sumptuous clay minerals and competent human resources in Nigerian ceramic industry still loom large in production, service and knowledge impartation; as a result of the unrestricted inflow of China wares into the country and such creating unfavourable ground for developing her ceramic industry to compete. Over-dependency on costly imported ceramic raw materials and equipment have also not helped the profession. Researches in areas of ceramic raw materials and possibilities are rarely undertaken. In the eighties ceramic industries in Nigeria were many, but now those left in operation are very few. The few ceramic industries are even operating below capacity. The factor responsible for this decline, are mainly stiff competition from cheap China wares, lack of equipment and raw material and lack of incentive from the government which may drive researches on raw materials and equipment that could possibly lead to inventions.

Be that as it may, if intensified effort continues, good dividend in ceramic profession will be witnessed. Understanding of clay capacity by the ceramists and sculptors in the Southwest of Nigeria according to physical and chemical properties beyond empirical level are still minimal. Many clay sources, their types and strengths are not even known to many ceramists. Research results in most cases have not been utilized to improve our knowledge in ceramics. After all the Yoruba says *Owo eni lafi n tun wa eni se* (one correct his short comings with his hands or by himself). Therefore ceramists in Nigeria should take audacious steps towards cultivating rich body of knowledge in ceramic materials, equipment and production in order to improve their skills and productivity in this era of technological advancement.

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