CERAMIC SCULPTURE

An experiment with clay bodies

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Being a Research Project Report Submitted to post Graduate School, Ahmadu Bello University in partial fulfilment of the Requirements for the Degree of Master of Fine Arts (M.F.A) in Sculpture

Faculty of Environmental Design
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Z a r i a

1989

DECLARATION

I, Esther Ada Onyilo do solemnly declare that this project title "CERAMIC SCULPTURE : An Experiment with Clay bodies", which involved the formulation and composition of clay bodies, finishing of sculptures and samples and the final documentation of works, was undertaken by me.

That I have also duly acknowledged all sources of materials consulted and or included in this report.

Signature: .....

Date: ....22./11/89.....

CERTIFICATION

This project report entitiled "CERAMICS SCULPTURE : An experiment with clay bodies by Esther Ada Onyilo meets the regulations governing the award of the degree of MASTER OF FINE ARTS (M.F.A) SCULPTURE of Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

EXTERNAL EXAMINER — DATE

INTERNAL EXAMINER — Dec. 12/1989 DATE

INTERNAL EXAMINER — Dec 8th 1989 DATE
Ag. C-A.

L.T. Bentu
HEAD OF DEPARTMENT — 20/12/89 DATE

DEAN, POSTGRADUATE SCHOOL — 3/5/90 DATE

DEDICATION

To Lewis Ojonye Ugbabe whose love, unfailing help and unrelenting encouragement have pushed me through to this end.

ACKNOWLEDGEMENTS

It is a great pleasure to acknowledge the help I have received directly and indirectly in the preparation of this project report. First to Sculptor Ben Ekanem for having encouraged me to undertake the research in the area of Ceramic Sculpture. He has been a source of inspiration and has remained a reference point in my academic pursuit.

I wish to express my thanks to Mr. Anthony Okpe for his help in the many phases of thinking and work which have resulted in this project report.

I am indepted to Mr. Charles Counts for his personal interest and assistance. And to Dr. Ahuwan who cared to support me with materials from his Section, whenever I could not get them in the Sculpture Section, I say thank you.

I wish to express my thanks to Professor Suleiman, Mallam Y.D. Hassan, Dr. Adetoro and Dr. Popoola for their personal interest and encouragement when I was tredding on troubled grounds. To Dr. Babalola, I say thank you for assisting me with reading materials when I was in need.

To Mr. Cornel Agim, Mr. Richard Baye, Ms. Fati Palmer, Mr. Jerry Buhari, Mr. Gani Odutoku, Mr. Celestine Trimnel, Mallam Nurudeen Abubakar, Mr. Oniye, Mr. D.J. Adeyemo, Mr. Paul Mutfang, Mr. Peter, Mr. Sunday Ogunwole, Mr. Joe Maugut, Miss Doyin Ogundipe, Mr. Uwa Ussen, and those that space would not allow me to mention, who kept asking about the progress of my work and the need to work hard I say thank you.

For Mallam Abdullahi Umar, Mallam Tukur Mohammed, Mr. Mike Aluwong, Mallam Abubakar Sanusi, Alhaji Tanko, and Mrs. Ewule - all of Ceramic Section, Ahmadu Bello University, Zaria, I am grateful for sharing your wealth of knowledge and experiences in ceramics with me.

To Mrs. Imaude, whose criticism, confidence, concern and company I enjoyed throughout her stay with me I owe gratitude.

A very special thanks go to my three friends Mrs. Nafisat Mohammed, Mrs Bene Otesanya, and Mrs. Lantana Odekunle whose constant prompting kept me on my toes. Many thanks also go to Dr. Dahiru Mohammed, Dr. Onucheyo, Mr. J. George, Mr. Daniel Ugbabe, Mrs. E. George and Mrs. Alice Ugbabe for their moral support.

To all members of staff of Fine Art Department especially the Librarian, the two store keepers and Miss Dorcas Adio, I say thank you.

Finally and most importantly is my gratitude to all members of my family, THE ONYILOS for their understanding and moral support.

ABSTRACT

This study has been a practical studio project involving the procurement and processing of raw materials which included rocks such as quartz and feldspar as well as clay like kaolin and secondary clays. The research also involved the formulation of clay bodies - earthen ware, stone ware and porcelain, the execution of sculptures, firing, and the application of glazes and colors on the sculpture produced as means of finishing.

Samples relevant to the study for both stone ware and porcelain bodies in the form of bars and the sixty-six tile triaxial blena were made. These were tested accordingly to determine workability, plasticity, wet , dry, color ana firing shrinkage. In addition glaze samples in designed tiles of the three bodies were made and also tested for finishing suitability.

The various bodies, firing temperature, glazes and colors, methods, photographic reproduction of works and literatures relevant to the project have been documented in this write up.

The end result of this project is the exhibition of all sculptures and samples undertaken in this research.

LIST OF TABLES

TABLE OF CONTENTS

LIST OF PLATES

CHAPTER ONE

1.1 INTRODUCTION

Nigeria as a nation can claim the pride of place as belonging to the club of nations with an early but fairly advanced culture in ceramic sculpture. Thanks to the artists of the Nok and Ife culture who produced a variety of sophisticated fired clay sculptures, some of which date back to two thousand years ago as confirmed by Eyo (1977). Others in this group could include pre-dynastic Egypt, the cultures of the middle East known as Mesopotamia, pre-Columbian South America and the Chinese T'ang dynasty.

Sad as it may appear, that pride of place begins to sound hollow in the light of present day trends world wide. Concerned nations have made concerted efforts to develop their culture in all spheres including ceramic sculpture. Today, such nations can boast of their achievements in ceramic sculpture. We hear of French porcelain, Russian porcelain, Italian porcelain, Chinese porcelain etc. But today, Nigeria a master of ceramic sculpture two thousand years ago virtually has nothing to show.

This research project is undertaken against this back drop. The raw materials are abundant and cheap. The hope is to make a new beginning that would promote and expand this ancient craft and indegenious art.

1.2 The Problem of the Study

This research attempts to push our frontiers of knowledge and artistic culture in the area of ceramic sculpture.

This researcher is not aware of any literary source or documentation on high fired ceramics with reference to sculpture in the Nigerian context. This may be due to the fact that a number of alternative sculpture materials had been available to Nigerian sculptors. These materials include plaster of paris (P.O.P), Isopon, bronze, resin, cement, etc. However, with the present economic crunch, most of these materials which have to be imported are becoming more and more difficult to procure.

It has therefore become imperative to look inwards considering the economic condition of Nigeria today. Clay and some specific rocks are materials which we can easily lay our hands on

because of their abundance and cheapness. Obrien's (1984) report on Abuja pottery quotes Cardew that, "Nigeria has almost unlimited reserves of all major raw materials necessary for ceramics and some of these raw materials are of excellent quality."

The need to tap these resources for ceramic sculpture cannot be over emphasised.

1.3 Aims and Objectives

1.3.1 The aims of this research are to experiment and explore the possible utilization of some ceramic clay bodies and techniques to arrive at producing ceramic sculpture for indoors.

The objectives therefore will be:

1.3.2 The employment of ceramic clay bodies to produce sculptures including:

A. Earthenware ceramic sculpture
B. Stoneware ceramic sculpture
C. Porcelain ceramic sculpture

1.4 Significance of the Project

The research aims at generating an awareness in the inherent potentialities of clay bodies as a media for sculpture. By the use of glaze and colours, the aesthetic qualities would be enormously enhanced. When this is juxtaposed on the unique advantage of clay namely, its abundance and therefore cheapness, the impact of this media for ceramic sculpture for indoor decorative purposes would be immense.

Furthermore, this study seeks to contribute to our artistic culture by way of introducing Nigerian porcelain sculpture as a feasible artistic medium.

1.5 Delimitation

The research deals mainly with the design and execution of sculptures of varying sizes. The materials used include Kankara (Kaolin), Bomo, Panhauya and the departmental clay (a fifty-fiftv percent mixture of primary and secondary clay), as well as Okene quartz and Zaria potash feldspar respectively.

There has not been an attempt to delve into the complex analysis of the composition and properties of these materials.

Available facilities in the Department of Industrial Design, Ahmadu Bello University, Zaria have been utilized to effect this research.

1.6 Definition of Terms

It has been found necessary to define a few terms used in the context of this project. Hence the meaning of the following words are,

1. Earthenware - This is a pottery whether glazed or unglazed, is porous in the biscuit state after firing.

2. Porcelain - This is composed of various clay and rocks such as kaolin, feldspar, and quartz. A vitrified white and translucent ware. This fires at 1300^{o}C plus. The body and glaze mature together to create a very thick body glaze layer.

3. Stoneware - These are ceramics made of opaque clay fired at a high temperature. These are vitreous in nature and nontranslucent. They are really a kind of earthenware fired at a greater temperature.

4. Glaze - This is any impervious glassy materials used to cover a ceramic article in order to prevent it from absorbing liquids, to beautify it and as a protection or foundation for various kinds of decoration.

5. Kaolin - China clay ($Al_2O_3 . 2SiO_2$). This is the purest type of clay approximating closely the idealized clay mineral kaolinite. It contains very little iron impurity and is therefore white with little plasticity.

6. Ball-clay - This is a highly plastic clay. Alone, it tends to be too fine and slippery for use, but addition of sand, grog and coarser and less plastic clay improves workability.

7. Calcine - This is the heating of a ceramic material or mixture to the temperature necessary.

8. Batch - A proportional mixture of materials. Batch weights are in fixed proportions to one another.

9. Cone - Pyrometric cone is made from mixture of ceramic materials formed to triangular elongated pyramids and designed to melt and bend over or squat at a given temperature.

1.7 Review of Relevant Literature

Historically, the use of terra cotta as a sculptural medium dates back to pre-historic time. Ceramics is an ancient craft cultivated by every nation of the world. The history is that of all arts, the slow progress from primitive to the refinement of shape, texture and decoration.

In Nigeria, ceramic sculpture finds its origin in Nok. Willet (1971) noted that the earliest known ceramic sculptural tradition outside Egypt is found in Nigeria. Terra Cotta sculptures often of a large scale of human and animal figures have been widely distributed across northern Nigeria in the tin mines near the village of Nok. Fagg (1977) agreeing with Willet, observed that in Northern Nigeria the accident of alluvial tin mining has helped to reveal the existence of a sculptural tradition two and a quarter millenia old, and that the first evidence of these ancient sculptures was found at Ham village of Nok. Eyo (1977) observed that Nok sculptures provide the earliest evidence so far of plastic art in terra cotta in the whole of Black

Africa. Nelson (1971) also mentioned that since clay is a common material, it is not surprising that in Africa we find many terra fragments dating from about 300 B.C. of the Nok culture and many terra cotta portrait head in the Ife styles.

The art and technology of ceramics generally and ceramic sculpture in particular, as we observe today have changed enormously in the past decade. Many nations of the world like China, Egypt, Italy, England, Russia, France, just to mention a few, that have started off as Nigeria, have made considerable advancement in experimentation, researches and development in their art of ceramic sculpture in terms of both materials and techniques. Ross-Mbe (1970) observed that there was technical development with the evolution in China from the glazed faience of the T'ang period, through the stoneware and porcelain of the Sung dynasty to the translucent and painted porcelain of the Ming and later periods. And in Europe, with the development from the rough earthenware of the Middle Ages, through the painted faience and maiolica of the 17th century to the feldspathic earthenware and bone-china of the 18th and 19th centuries. Burton (1921) also maintained that during the Han (200 B.C., - 220 A.D.) and T'ang

(698 - 906 A.D.) dynasties experiments and researches in ceramics resulted in the invention of porcelain which is today referred to as China-ware.

Experimental craftmanship of a high order was vigorously pursued in many directions and this led to many nations establishing pottery manufactories According to Marryat (1857), in Staffordshire for instance, is situated the large manufacturing district called the potteries. The progress of Staffordshire manufactories could be attributed to Josiah Wedgwood. He may be regarded as one of those who have most contributed to advance the potters art. Wedgwood did not only produce table wares, but also introduced the production of ceramic sculpture. He employed the assistance of an artist John Flaxman in the preparation of models for high works of art, among which may be mentioned a beautiful set of chessmen, which he was the first in modern times to execute in pottery.

Honey (1949) also noted that although earthenware figures had been made in Italy and Holland (and of course, in porcelain by the Chinese) for many years, the first European porcelain figures

came from Meissen and the modeller was Kandler, who set an example quickly followed by most of the European factories including the English Bow, Chelsea, Derby, Briston, etc. Marryat (1857) on the other hand said that Charles Adam a celebrated French sculptor was employed by the King of Prussia to execute at Berlin a statue of Field Marchal Schwerin in porcelain.

In Nigeria, Heath (1962) observed that the government started a pottery Training Centre in 1952 at Abuja where new and more advanced technical methods especially glazing could be taught. He went further to say that Ladi Kwali, made large pots in traditional styles of the Gwarin-Yamma using special method. These pots according to him have been much admired in England and other countries and they can infact be set without any fear beside the best pottery of any country. The Niger State art council pamphlet of art exhibition (1988) agrees with Heaths observation that the introduction of modern pottery technique in the 1950s by a Briton Mr. Michael Cardew has helped to popularise this tradition nationally and internationally through late Ladi Kwali.

The history of pottery world wide its utility and the aesthetic purpose of this craft, leaves no one in any doubt that it is a pretigious art and of royal patronage. In China for instance, during the T'ang dynasty (698 - 906 A.D.) figurines were modelled which bore witness to the elegance and luxury of the time. Chinese emperors obtained by high premiums the unrivalled manufacture of the egg-shell porcelain. Similarly the Dukes of Urbino-Italy by their patronage introduced the beautiful majolica. In Italy also, a sculptor Luca Della Robbia (1400 - 1482), worked with glaze terra cotta to meet up with the demands of royal houses. Other reigning Princes of Germany found and brought to perfection at their own expenses the porcelain manufactures of their own respective countries. It is also in the field of ceramic sculpture that the Etruscans were most noted. Nelson (1971) noted that terra cotta was used extensively in the Etruscan temples and that wealthier families would bury their dead in large ceramic coffins surmounted by portrait figures of the dead.

Such is the development of high fired ceramics generally and ceramic sculpture in particular that the Chinese ceramics among others have made an

impression on other nations of the world.

Sculpture and modelling played an important part in the works of the Ming potters who followed along this path and also in the footsteps of their predecessors of Han and T'ang time.

1.7.1 The Nigerian Situation

The general trend in Nigeria concerning ceramics tend to lean towards household wares, toilet wares, tiles and burnt bricks, with little or no emphasis on ceramic sculpture.

The researcher observes that most sculptures in the contemporary Nigerian art scene both in institutions and by individuals are executed in materials such as plaster of paris, wood, cement, plastic etc. However where clay is used, its use is limited to terra-cotta earthenware.

This trend can be illustrated by the works in the sculpture garden of the Department of Fine Arts, Ahmadu Bello University Zaria. These works executed by present and past students are either in plaster of paris, cement or metal. Where the students produce terra cotta works, they are 'earthen ware fired in an open air improvised kiln without standard specification nor regulated

temperation. Similar trends also exist in the Department of Fine Arts, Obafemi Awolowo University, Ile-Ife as well as Benue State Polytechnic, Ugbokolo, Benue State, University of Benin and Auchi Polytechnic, Bendel State to mention a few. Abayomi Barber's School is not left out in the trend. Ben Ekanem's Queen Amina adorning the front of the National Theatre Igahmu, Lagos, an individual's work is finished in cement. Similarly, Ben Enwonwu's 'Shango' at Nigerian Electric Power Authority (N.E.P.A) building in Lagos is in bronze while Richard Baye's 'sign of the times' is in plastic (isopon).

However, an artist like Demas Nwoko did sculptures in terra-cotta which were mainly earthenware. Williams (1966) observed that Demas Nwoko in his Ibadan studio, tried to review the art of terra-cotta which seems the basic sculpting techniques of the Nok culture by constructing a kiln to improve the firing temperature of terra cotta. Nwoko he said produced works to the finest examples we know, from Nok to the master pieces of Ife. Nwoko's works include, 'Soja come, Soja Stay' 'Soja go' and Dancing Pair, to mention a few.

Finally, this researcher notes the inadequate literature on high fired ceramic sculpture of Nigeria. It is in the light of this inadequacy that this research is undertaken to introduce high fired ceramic sculpture of Nigeria, i.e. going beyond earthenware through stoneware to Nigerian porcelain. Furthermore, the research intends to introduce the use of glazes and colours as means of finishing. According to Okpe (1986), finishing plays an important role in the final presentation of a sculpture. It is developed to change the appearance and preserve surfaces. Conrad (1976) also maintained that clay, when fired and glazed renders the porous pot impervious to mixture and this gives man a fine imperishable material of strength, beauty and great artistic expression.

1.8 Methodology

The project has been studio oriented and experimental. There was a purposeful selection of materials based on the previous knowledge of the subject matter and the availability of materials, i.e. clays and rocks for the preparation of the bodies for sculptures.

The sculptures produced were bisque fired at a temperature of about 900°C. After which the works were finally glazed with about seven different oxides.

1.8.1 The Raw Materials

The raw materials for this research are as follows:- Feldspar, Quartz, Kaolin and secondary clays.

The following clays were used in the study. Okene quartz from Kwara State, Zaria feldspar from Kaduna State, Kankara (Kaolin) clay from Katsina State, Bomo and Panhauya both secondary clays from Kaduna State. These clays were used as clays and plasticizers respectively in the porcelain body.

Treatment and Processing of Raw Materials

The materials procured were processed in the scheme drawn below.

KANKARA (KAOLIN)	OKENE QUARTZ
Soaked	Washed
blunged	calcined to 900°C
Sieved	jaw crushed
dried	water milled for 24 hours
stored.	dried
	stored.

ZARIA FELDSPAR

Washed

Calcined to 900°C

jaw crushed

water milled for 18 hours

dried

Stored.

BOMO CLAY

Soaked

blunged

sieved

dried

Stored.

PANDAUYA CLAY

Soaked

blunged

seived

dried

stored.

1.8.2 Body Formation (see Table 1)

A sixty-six tile triaxial test of the three basic materials for porcelain; kankara (kaolin) Okene quartz and feldspar, was made and fired to 1280°C.

To arrive at the different mix, a level teaspoonful of each of the materials was measured out into a bowl in the varying propotions as drawn in the traxial blend. Each batch was then mixed in a little quantity of water into thick pastes, and placed on bisqued tiles of one inch by

one inch (1" by 1") to dry.

This was done to ensure proper blend and to test for plasticity.

The triaxial blend test ensures that blending is done to arrive at different mix of a porcelain body. According to Nelson (19 78), the use of a triaxial diagram for planning experiments has many implications in ceramics. This system he says is especially helpful in gaining knowledge about relative fluxing power of various compounds, their effects on colorants and blending of colorants and opacifiers. Gukas (1985) quoting Singer (1979) notes that the sixty-six triaxial blend was adapted in order to achieve a very wide variations of bodies.

1.8.3 Body Preparation and Composition

1.8.4 Porcelain

In preparing this body, feldspar, quartz (flint) Bomo clay (secondary) kaolin (primary), were mixed together in varying proportions using the ball mill.

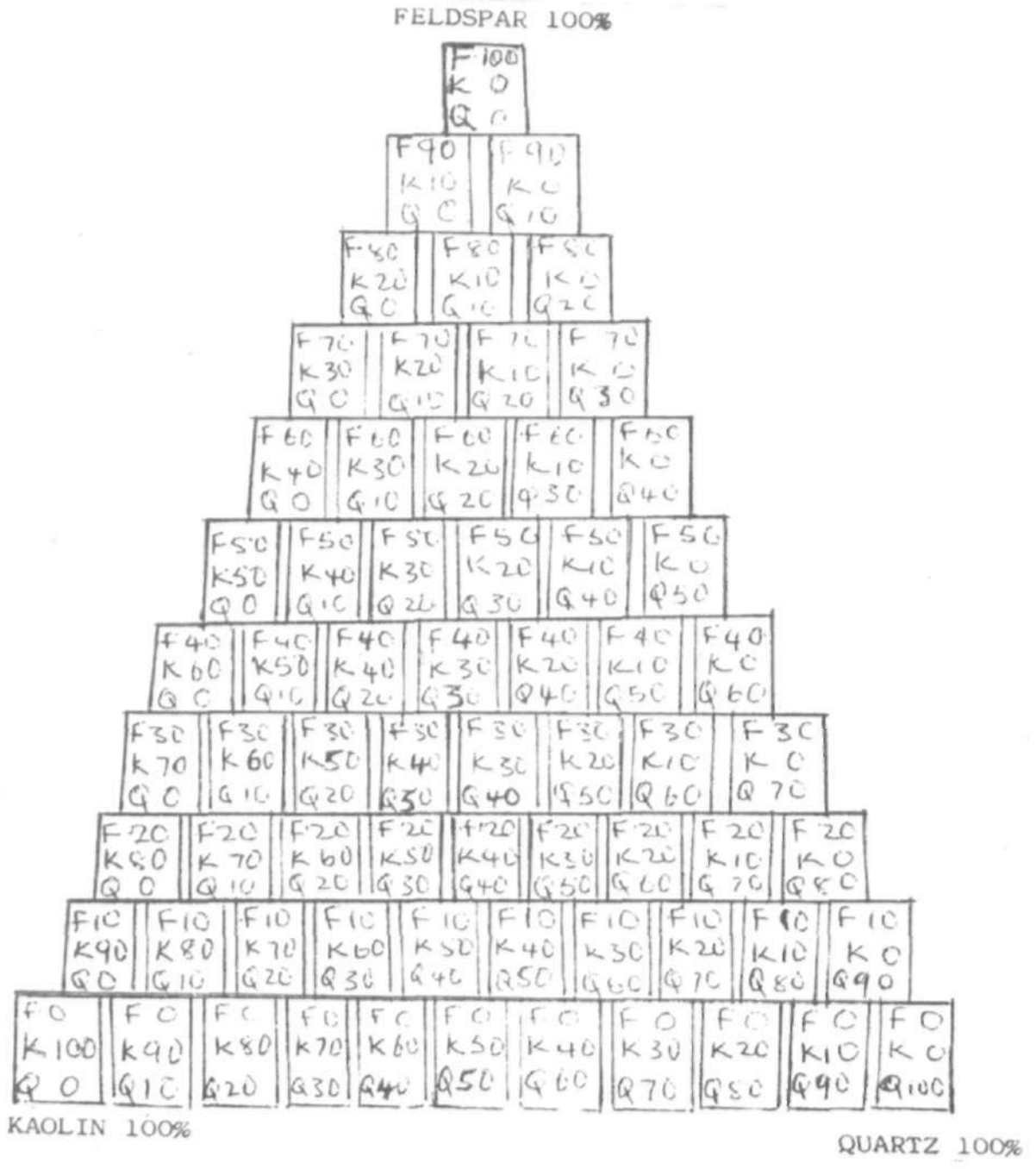
For the purpose of clarity, this body composition is thus:

Kankara (Kaolin)	42%
Feldspar	33%
Flint (quartz)	15%
Bomo clay	10%

After these materials had been ball milled, the liquid slip was poured into plaster of paris moulds to help absorb the excess water in the clay in order to render the clay hard enough for workability.

Table I

Sixty-six Tile Triaxial Blend



SOURCE: Glenn C. Nelson (1971) CERAMICS
A Potter's Handbook

According to Counts (1973) in developing your own clay mixture, you should be concerned about three factors, workability, fireability and filler material. On body composition, Okoruwa (1986) notes that a lot of body formulations in pottery without reliable clear cut analysis of chemical compositions of materials are often by intuition. He went further to explain that porcelain has many body compositions such that the amount of the different components used will largely be dictated by the nature of the materials available and criteria for choosing a particular body recipe. Rhodes (1959) also maintains that there is no scientific or exact way of arriving at clay body composition and the best one can do in first trials is an educated guess.

It is in the light of the above observations that the author formulated the body as given in the porcelain body composition. Finally in body formulation, it is of note worthy that all raw materials are often calculated to a hundred (100) for convenience of preparation.

1.8.5 Stoneware

Rhodes (1959) observed that any clay may be called stone ware clay which can fire to a temperature of 1200°C. He points out that where no natural stoneware clay is available, fairly satisfactory bodies can be made from mixtures of ball clay, kaolin, flint and fluxes.

On the basis of the above observation, this body has been prepared thus:

Kankara (Kaolin) 50%

Panha yan clay 50%

These materials were mixed together in water and the liquid slip poured into plaster of paris moulds to absorb the excess water. When it was hard enough to allow for workability, three bars of 15 cm each were made to test for wet, dry and firing shrinkage. The result showed that the mixture is of good workability with relative plasticity, and the shrinkage of the dried bars negligible. The three bars were then bisque fired at a temperature of 900°C. Here again the firing shrinkage is negligible. To test for high firing, one of the bars was returned into the kiln and fired to a temperature of 1280°C. The result showed a relatively high shrinkage, on the other

hand the bar changed color to grey and has a ringing sound which is expected of stoneware.

According to Rhodes (1959), stoneware clays vary considerably, not only in fired color but also in working properties. Some may be very plastic with an attendant high drying shrinkage, while others may be relatively non-plastic and have a low shinkage.

1.8.6 Earthenware

Since any clay can be used for earthenware works, Bomo clay (secondary clay) mixed and wedged with fairly coarse grog, has been used in this study.

This body did not have to undergo the refining process as the porcelain and the stoneware bodies.

1.9 Glazes

In planning glazes for pots, the best principles to follow according to Rhodes (1969) is to make the most simplest means; tests should first be made to give a wide selection of glazes from which to choose.

A few tests on colors textures and effects were therefore carried out to determine the glazes and colors that would best suit each of the clay bodies used in the execution of the various sculptures produced. Fairly large designed test tiles were produced from two of the clay bodies i.e. stoneware and porcelain. The earthenware body has been left out of the test because it generally can not go beyond a temperature of about 1100°C. Whereas stoneware and porcelain can go to a temperature of about 1280°C and above.

The test tiles were bisque fired to a temperature of about 900°C after which seven different test glazes were prepared from black copper oxide, kaolin, rutile, manganese, red iron oxide, Bomo clay and Black iron oxide for application. Tenmoku and white glazes were prepared from the ceramic studio i.e. studio preparation.

3.9.1 Glaze Test Preparation

The glaze was prepared as can be seen in the scheme drawn below:

Materials	Quantity
Black copper	1 tablespoon to
Kaolin	4 tablespoons mixed in plenty of water.
Rutile	1 tablesoppon to
Kaolin	4 tablespoons mixed in plenty of water.
Manganese	1 table spoon to
Bomo clay	4 tablespoons mixed in plenty of water.
Red iron oxide	1 tablespoons mixed in plenty of water.
Black iron oxide	1 tablespoon to
Bomo clay	4 tablespoons mixed in plenty of water.

The tiles were then dipped into the prepared glazes and fired to a temperature of 1280°C. (Cone 5_H). The result has been recorded thus, see table below.

1.9.2 Glaze Test Result

S/No	Body	Glaze	Colour
1.	Porcelain	Tenmacole	Dark glossy
2.	Stoneware	White glaze	Grey glossy
3.	Stoneware	Tenmacole	Dark glossy
4.	Porcelain	White	L.Grey glossy
5.	Porcelain	Rutile	Orange light
6.	Stoneware	Red iron oxide	Dark
7.	Stoneware	Manganese	Dark
8.	Stoneware	Manganese	Brown
9.	Stoneware	Black copper	Brown
10.	Porcelain	Black copper	Dark
11.	Earthenware	Rutile	Yellow orche
12.	Porcelain	Red iron oxide	Brown
13.	PPorcelain	Black iron oxide	Dark
14.	Stoneware	Black copper oxide	Brown
15.	Stoneware	Red iron oxide	Brown

1.10 Organization of the Project Report

This project report is divided into three chapters. Chapter one introduces the problem, aims and objectives through significance of study to definition of terms. Review of relevant

literature and works, methodology and studio experiment with tables are also included in this chapter.

Chapter two submits a catalogue of works, documentation of the techniques of accomplishing each sculpture and samples produced in the course of study.

The last chapter presents a brief summary and conclusion of the project report along with recommendations.

CHAPTER TWO

CATALOGUE OF WORKS AND DOCUMENTATION OF TECHNIQUES

The sculptures and samples presented for the illustration of high fired ceramic sculpture and techniques are catalogued in this chapter. The three clay bodies, (earthenware, stoneware and porcelain) used in executing the sculptures and samples make up the background for illustration. This chapter presents photographs of works, which are referred to as plates in this report and the documentation of the various techniques of executing and finishings of each sculpture.

For easy identification the sculptures have been grouped and abbreviated thus, Earthenware (EW), Stoneware (SW) and porcelain (PN).

2.1 Earthenware

Two sculptures have been executed in earthen ware body and are numbered EW1 and EW2.

EW1 MILK OF LIFE

This is a two figure in one biomorphic form, modelled to exhibit spiral forms and lines. It was bisque fired to a temperature of about $900^{o}C$.

Since this research deals with high fired bodies, this piece has been left in its bisqued form as any attempt to achieve a higher firing temperature will result in its melting. See Plate I.

Plate I: MILK OF LIFE

EW2: THOUGHTS

This sculpture is a terra-cotta piece and biomorphic in nature. This piece exhibits linear lines and care has been taken not to make it bilaterally symmetrical.

Plate II: THOUGHTS

Like any earthenware, the piece has been left in its bisque state, for any attempt to take it through high firing temperature would result in its melting. See plate II.

FINISHING

Okpe (1986) finishing for terra-cotta.

" A solution of a pinch of black artist's powder colour and polish was made, using thinner as a solvent. This was then applied onto the surface of the sculpture with a soft brush. The sculpture was then left for about five minutes after which a thinner soaked cloth was used to wipe high points to achieve highlight and left to dry. Liquid wax was finally sprayed thinly and later polished with dry cloth. This gives an aged, brown wood-like effect."

2.2 STONEWARE

There are eight sculptures and three samples produced in stoneware body and labelled as follows:- SW1, SW2, SW3, SW4, SW5, SW6, SW7, SW8, SW9, SW10 and SW11 respectively.

SW1, ZEBRA

This sculpture is a representational piece in the form of a zebra. It is modelled freely and well smoothened without exhibiting any tool marks. It was then hollowed out, joined, dried, and bisque fired to a temperature of about 900°C in an electric kiln. Finally, it was high fired for stoneware at about 1280°C, i.e. Cone 5_H ($\triangle 5_H$). No oxide was applied deliberately so as not to give the zebra color effect. The hooves were dipped into white-wash liquid which is a mixture of determined ratio of alumina and Kankara (Kaolin) clay with water. This gave the hooves a brownish, redish-like effect instead of the greyish color obtained in the stoneware test. This change could be attributed to the fact that in the course of the high firing, the piece was placed quite close to the burner of the kiln. A few resultant cracks therefore can be noticed on the piece. See Plate III

Plate III: ZEBRA

SW2: LEATHER WORKMAN

This is a representational sculpture of a Hausa man seated and sewing a leather bag. This piece was modelled freely with care taken to treat the drapery. It was then cut, hollowed out, joined, dried and bisque fired to a temperature of about 900°C. See plate IV.

Plate IV: LEATHER WORKMAN

Finishing

A composition of oxide was prepared (see methodology) and applied on the piece using a painting brush. Rutile was applied on the apparel while manganese was applied on the leather bag. After the application, some of the oxide was rubbed off to highlight some specific points. The piece was then high fired in a gas kiln for eight hours (8 hrs) to about 1280°C. (5H). The result shows it has a metalic or ringing sound and the rutile oxide applied on the apparel gave an orange color while the manganese gave a brownish color on the bag. The other parts of the body where no oxides was applied gave a grayish effect and generally a matt like effect was achieved.

CW3: CAT

This is a representational animal form modelled, cut, hollowed out, joined, dried and fired to a temperature of about 900°C. See plate V.

Plate V: CAT

Finishing

Three different oxides were applied on the bisqued cat using a painting brush. These include rutile, manganese and black copper oxide preparation (See methodology). Rutile was first applied on the body, then a splash of manganese followed, finally black copper oxide was applied to run freely into the other two oxides. It was

then left to dry. After it had dried, it was high fired to a temperature of about 1280°C ($\Delta\ 5_H$). The result shows black, brown and organge colors plus a few resultant cracks.

SW4: TIE-DYE WORKMAN

This is yet another representational piece, expressing concentration and attention with which the man dyes the cloth. This piece is a free hand modelling, cut, scopped, joined, dried and bisque fired. See Plate VI.

Finishing

Red iron oxide and manganese was applied on the piece using a painting brush. The piece was left to dry, after which some of the oxides was rubbed off to high light some specific areas. The piece was then fired to a temperature of about 1280°C ($\Delta 5_H$) in a gas kiln. The result shows a metalic purple color effect and of course matt like, with a few resultant cracks.

Plate VI: TIE-DYE WORKMAN

SW5: MILK MAID I

This is a naturalistic figure of a Fulani milk maid in a reclining position. It was modelled, cut, scooped, joined, dried and bisque fired to a temperature of about 900°C. See plate VII.

Plate VII: MILK MAID I

Finishing

With the use of a painting brush, red iron oxide was applied to the piece and left to dry, after which some of the oxide was rubbed off at specific areas to give high lights. The piece was then fired to a temperature of about 1280°C ($\Delta\ 5_H$). The result shows a color effect which is matt-like and metalic-purple.

SW6: TIV WOMAN

This is a representational below life size burst of a Tiv woman. It was modelled freely and expressive with the Tiv cultural tattoed face. It was hollowed out, dried and fired to bisque. See plate VIII.

Finishing

Black iron oxide was applied with a painting brush. It was left to dry after which some of the oxide was rubbed off to indicate high points. It was then fired to a temperature of about 1280°C (Δ 5_H) in a gas kiln. The result shows a metalic black color which is matt-like.

Plate VIII: TIV WOMAN

SW7: UNTITLED PORTRAIT I

This is also a representational portrait modelled, cut, scooped, joined, dried and fired to a temperature of about 900°C. See plate IX.

Finishing

With the use of a painting brush, rutile was applied all over and left to dry, after which it was fired to a temperature of about 1280°C ($\Delta 5_H$). The color effect is orange and matt-like.

Plate IC: UNTILED PORTRAIT I

SW8: HAUSA WOMAN

This is a naturalistic figure of a seated Hausa woman. It was modelled, hollowed out, dried and fired to a temperature of about 900°C. See plate X.

Plate X: HAUSA WOMAN

Finishing

Red iron oxide was applied on the wrappers and headtie, then left to dry, after which some of the oxide was rubbed off to give high lights. After that, manganese was applied on the face and other parts of the body exposed. Here again, some of the oxide was rubbed off to highlight high points. The piece was then fired to a temperature of about 1280°C ($\Delta 5_H$). The result shows light purple color effect on some areas of the wrappers and dark at others, while the face and other exposed parts of the body show black-matt effect.

SW9: SAMPLE I

This is a test bar made from the stoneware body to test for wet, dry and firing shrinkage. (See methodology); it was left to dry then fired to a temperature of about 900°C. See plate XI.

Plate XI: SAMPLE I

SW10: SAMPLE II

This is yet another bar made from stoneware body which after drying was bisque fired to a temperature of about 900°C and then re-fired in

a gas kiln for high firing to a temperature of about 1280°C (Δ 5_H) to test for shrinkage, strength, sound and color. The result shows a relatively high shrinkage, metalic-strength, ringing sound and grayish color . See Plate XII

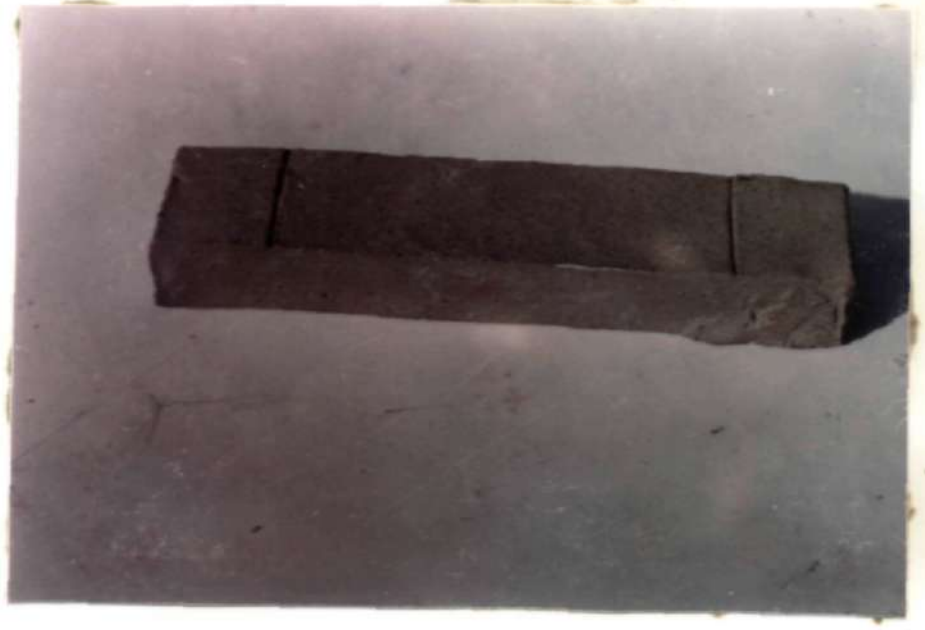


Plate XII: SAMPLE II
High Fired Stone-ware Bar

SW 11: SAMPLE III

These are test tiles made from stoneware body. They were designed, and left to dry after which they were bisque fired to a temperature of about 900°C. Various oxides were then applied on each tile and then fired to a temperature of about 1280°C (Δ 5_H) See methodology) See plate XIII

Plate XIII: SAMPLE III
High Fired Stoneware Test-Tiles

2.3 PORCELAIN

Twelve sculptures plus two samples were executed in porcelain body and have been numbered thus: - PN1, PN2, PN3, PN4, PN5, PN6, PN7, PN8, PN9, PN10, PN11, PN12, PN13, and PN14 respectively.

PN1: MILK MAID II

This is a representational figure of a Fulani milk-maid, depicting seriousness. This piece was modelled, scooped, dried and bisque fired in an electric kiln to a temperature of about 900°C. See plate XIV.

Finishing

Black copper oxide was applied on the piece using a painting brush, and left to dry, after which some of the oxide was rubbed off to high light some specific areas. The calabashes were painted with rutile and black copper oxides to give contrast. (See methodology for the preparation of the oxides). These were put through a high firing of 1280°C ($\Delta\ 5_H$). The result shows a black color effect with highlights on the figure while the calabashes present orange and black color effect. Cracks are also noticed.

Plate XIV: MILKMAID II

PN2, FATHER AND SON

This is a biomorphic piece, stylized and depicting sorrow. It was modelled, scooped, dried and biscque fired to a temperature of about 900°C. See plate XV.

Finishing

It was dipped into white glaze and left to dry, after which it was fired to a temperature of about 1280°C ($\Delta\ 5_H$). The result shows a white color effect, with the glaze showing some signs of foams, due to exeessive thickness of glaze. The piece also has some cracks.

Plate XV: FATHER AND SON

PN3: KANURI LADY

This is a representational sculpture, modelled with a lot of emphasis on the elaborate hair style. It was modelled freely, hollowed, dried and bisque fired. See plate XVI.

Finishing

Rutile was applied on the face and neck while black copper oxide was applied on the hair using a painting brush. It was then left to dry after which it was fired to a temperature of about 1280°C (Δ 5_H). The result shows an orange color effected on the face and neck, while the black copper oxide failed to give the black effect on the hair, rather a grayish effect was obtained. The piece also has a lot of cracks.

Plate XVI: KANURI WOMAN

PN4: LONESOME

This is a biomorphic form depicting some flows of spiral lines without portraying bilateral symetry. It was modelled, scooped, dried and bisque fired to a temperature of about 900°C. See plate XVII.

Finishing

Black copper oxide was applied on the thin lines that form the interior of the piece outward with a small painting brush, after which it was fired to a temperature of about 1280°C (Δ 5_H). The result shows a grayish color with a network of cracks almost all over the piece, while the expected black color effect disappeared.

Plate XVII: LONESOME

PN5: RECLINING FIGURE

This is a bimorphic stylised form modelled, scooped, dried and bisque fired to a temperature of about 900°C. See plate XVIII.

Finishing

It was dipped into a tenmoku glaze preparation and left to dry, after which it was fired to a temperature of about 1280°C. (Δ 5H). The result shows a dark greenish glossy color effect with a little cracking.

Plate XVIII: RECLINING FIGURE

PN7: SCHOOL MISTRESS

This is yet another representational portrait below life size, depicting seriousness and elaborate hair style. This piece was modelled, scooped, dried and bisque fired to a temperature of about 900°C. See plate XX.

Finishing

Using a painting brush, manganese was applied to the jacket, while rutile was applied to the inner wear, and black copper oxide was applied to the hair and the face. Some of the oxides was rubbed off for highlight effect, after 1280°C ($\triangle\ 5_H$). The result shows black hair-do with dark face, good highlights, an orange color for the jacket with a few cracks.

Plate XX: SCHOOL MISTRESS

PN8: BIRD

This is a naturalistic bird form, modelled freely to depict tool marks. It was scooped, dried and fired to a temperature of about 900°C. See plate XXI.

Finishing

With a painting brush, rutile; manganese and black copper oxides were applied on the piece without any rigidity. It was then left to dry after which it was fired to a temperature of 1280°C (Δ 6A) which is an equivalent of Cone 5H (Δ 5H). The result shows black and orange color effect which makes the work appear stone-like.

Plate XXI: BIRD

[illegible] "KWARYANMOLO"

This is a character head below life size, and expressive. It was modelled freely, scooped, dried, and bisque fired to a temperature of about 900°C. See Plate XXII.

Finishing

The piece was dipped into black iron oxide. Then left to dry after which some of the oxide was rubbed off to highlight high point. It was then fired to a temperature of about 1280°C. (△ 5H). The result shows a brown color with some crawling effect, making the piece appear as if the brain spalshed all over the head.

Plate XXII: "KWARYANMOLO"

PN10: PURDAH

This is a naturalistic portrait below life size, modelled freely to depict drapery. It was scooped, dried, and bisque fired to a temperature of about 900°C. See Plate XXIII

Finishing

With the use of a painting brush, black iron oxide was applied on the piece. Some of the oxide was rubbed off after it had dried, for highlight. ($\Delta\ ^5H$). The result is a dark brownish color effect with a network of cracks.

Plate XXIII: PURDAH

PN 111 - RELAXATION

This is a biomorphic form in a relaxed seated position. It was modelled, cut, scooped, joined, dried and fired to a temperature of about 900°C. See plate XXIV.

Finishing

It was dipped into black copper oxide and left to dry, after which it was fixed to a temperature of about 1280°C. ($\triangle$ ^{5}H). The result shows a complete black color effect with numerous cracks.

Plate XXIV: RELAXATION

PN13: SAMPLE IV

This is a body test prepared from quartz, kaolin and feldspar. (See Table 1). The sample was then fired to a temperature of about 1280°C. See plate XXVI.

Plate XXVI: SAMPLE IV: BODY TEST

PN14: SAMPLE V

These are test tiles made from porcelain body. They were designed and bisque fired to a temperature of about 900°C. Various oxides were then applied on each, after which they were fired to a temperature of about 1280°C ($\triangle 6A$). See plate XXVII.

Plate XXVII: SAMPLE V
High Fired porcelain Test Tiles

2.4 MATERIALS

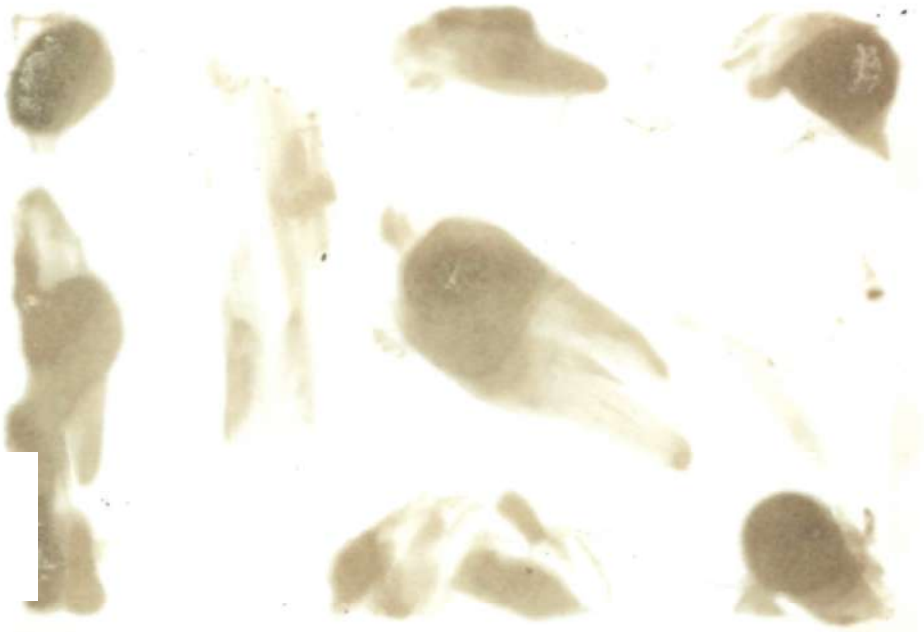
Materials used in this study have been abbreviated thus: Secondary clay (SCY) Ball Clay (BCY) Quartz (QTZ) Kaolin (KLN) and feldspar (FPR).

SCY1: SAMPLE VI
Plate XXVIII: SECONDARY CLAY

BCY2: SAMPLE VII
Plate XXIX: BALL CLAY

QTZ3: SAMPLE VIII
Plate XXX: QUARTZ

KLN4: SAMPLE IX
Plate XXXI: KAOLIN



FPR5: SAMPLE X
Plate XXXII: FELDSPAR

CHAPTER THREE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The aim of this project was to have a studio experiment and document methods and materials used in producing some high fired ceramic sculptures which is not entirely new in the Nigerian setting. This art has been practiced since the Nok civilization. What is new however as shown in this project is the materials used in this study. Relevant literature was collected from acknowledged sources for this purpose.

Sculptures were executed using processed clays and rocks, classified as earthnware, stoneware and porcelain. These sculptures were fired to varying temperatures and finally finished in oxides, noting results at each stage and keeping records. A detailed documentation, description of techniques and finishing of each piece is contained in chapters one and two of this project report. Most of the materials used

for this study were procured locally and the advantage of using these materials is the cheapness.

In conclusion, it is important to note that literature sources relating to ceramic sculpture generally are available and the raw materials are in abundance except that Nigerian schools of sculpture and sculptors alike have neglected this area of our ancient art.

Recommendations

In the course of putting this project report together, this researcher noted that Nigeria has abudant raw materials such as clays and rocks for the production of ceramic sculptures.

There are also numerous literature sources available on ceramics generally, but these sources make references mainly to high fired ceramic sculptures of other nations of the world, that have not only developed the art but have perfected it from earthenware through stoneware to porcelain with little or no reference to the development of Nigerian ceramic sculpture.

Furthermore, the result of the sculptures produced as the final part of this project report, exhibited numerous net-work of cracks which could have been as a result of:

1) Unequal distribution of heat in the kiln due to lack of pyrometric cones or pyrometers to determine proper temperature regulation in the kiln.

2) Fast cooling of the kiln after firing is stopped at the given firing time.

3) Expansion in the body used for the sculptures due to heat.

4) Weight of the sculptures.

5) Inadequate proportion of one or more of the materials used in the body preparation.

In the light of the above observation made therefore, this author recommends that:

i) Nigerian schools of sculpture and individual sculptors should experiment more with our local materials since they are in abundance and can easily be procured.

ii) Nigeria should take a stride now and continue in researches and documentation in this area of our ancient art for the benefit of sculpture students and practicing sculptors alike.

iii) Kiln construction should be an integral part of the study in ceramic sculpture for future research since all sculptures produced would have to be fired.

iv) More experiments should be carried out to solve the problems or findings stated under 1, 2, 3, 4 and 5 respectively.

Finally this author recommends that since this research was limited to the modelling technique; further studies in the area of slip casting should be undertaken, while researches into the use of our local materials for oxides be introduced as an integral part of ceramic sculpture to serve as means of finishing.

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