

**DESIGN AND PRODUCTION OF DECORATIVE FACIAL SLICES FOR
THE BUILDING INDUSTRY**

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CERTIFICATION

I hereby declare that this submission is my own work towards the MFA and that to the best of my knowledge, it contains no materials previously published by another person nor materials which have been accepted for the award of any other degree of the University, except where due reference has been made in the text.

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DEDICATION

I dedicate this work to God Almighty and my children Eunice Rosina and Nana Yaw
Barfi-Mensah.

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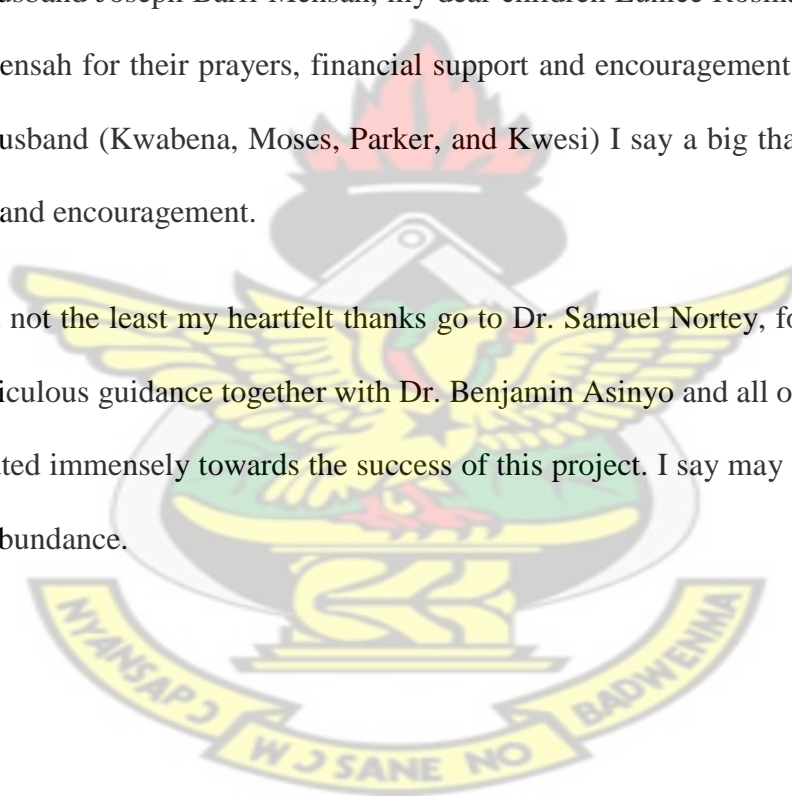
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All glory and honor to our Almighty God for granting me the grace, strength, wisdom, knowledge and understanding to enable me carry out this project with success.

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ABSTRACT

The study explored the possibility of producing facial slices using locally available materials. The prime motivation for the study stems from the fact that most facial slices found in the Ghanaian open market are imported into the country and appears very exorbitant to the average Ghanaian citizen. In addition, the slices found on the Ghanaian open market are very plain and devoid of aesthetic look. Studio based together experimental and observational approach were used in producing the facial slices. Geotechnical methods were used to ascertain the physical properties of Mfensi clay and other additives in order to know its suitable body for the production of the slices. In order to achieve an aesthetic look, traditional motifs were manipulated and generated using Adobe Photoshop into philosophical designs. The designs were incorporated onto the surfaces of the slices with the view to promoting and preserving the cultural heritage of Ghanaians. Among the various methods used in transferring the designs onto the surfaces of the slices were incision, stamping, springing, Sgraffito, texturing, marbling, and embossing. The study concluded based on the results of the experiments that the locally available materials are suitable in the production of facial slices since its porosity, shrinkage and over all properties are standard to its production. In addition, the slices produced were preponderantly artistic since the traditional designs incorporated on the surface reveals aesthetic sensations in the eyes of viewers.

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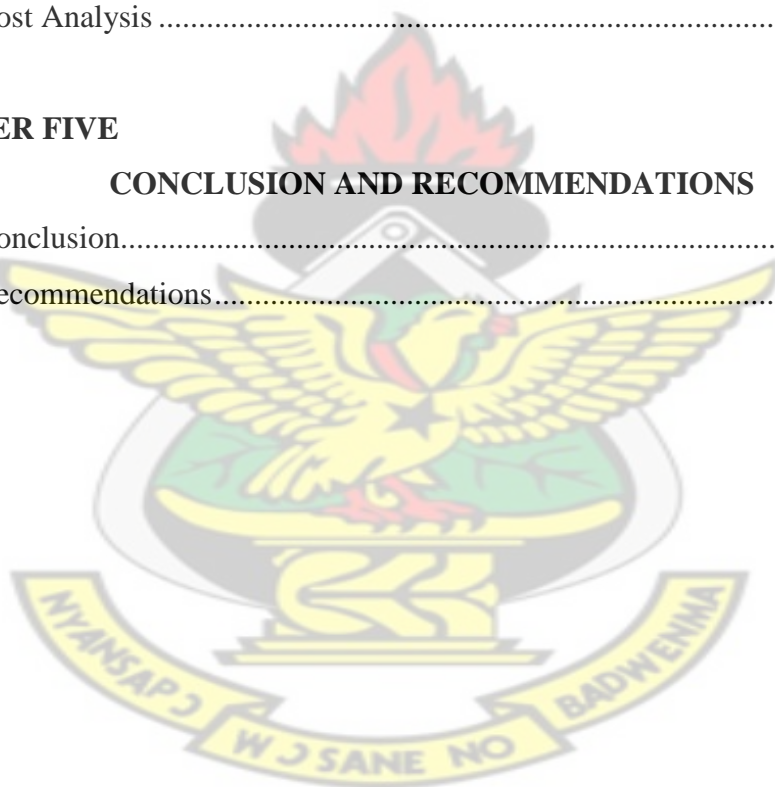
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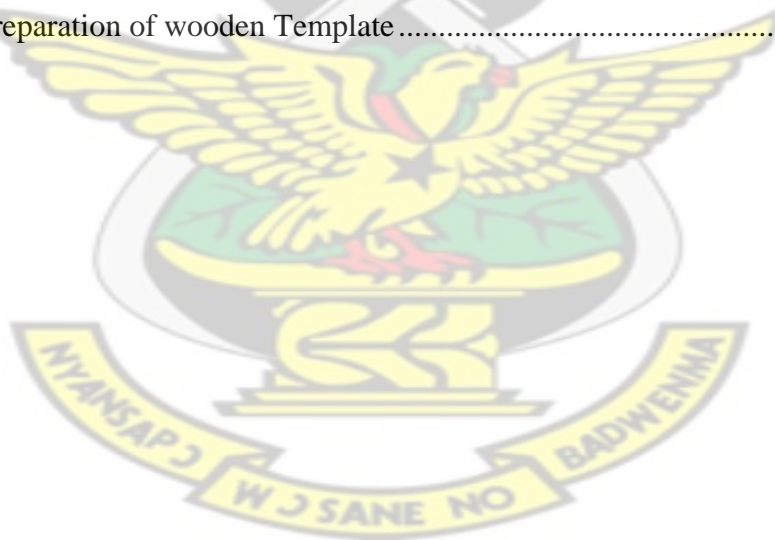
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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The principal motivation for this project stems from the fact that, the aesthetic qualities of a building depends largely on its facing finish. The use of facial slices as a facing finish in the Ghanaian building industry is burgeoning. According to Pyne (1997), “slices or facing tiles in general are said to combine attractive appearance with structural strength and good resistance to weathering.” A careful study reveals that only few industries are into the production of facial slices in Ghana. This obviously means that, the facial slices found on the markets are imported, which inadvertently increases the price of the facial slices. To the present researcher, although these facial slices are durable and serve the purpose of putting our building into stupendous aesthetic dimension, the ordinary citizen is not able to purchase the product.

Consequently, Ghana is endowed with many raw materials and the chief material of facial slice, which is clay, is readily available in Ghana. In this vein, the researcher is of the view that a locally clay body can be compose with the locally available raw materials which could serve the purpose of a facing finish in our building industry. Again, the researcher believes that artistic designs could be generated from traditional symbols and from natural objects to enhance the look of the slices. In addition, one striking characteristics of the facial slices found on the markets are all very plain and glazed.

To the present researcher, the incorporation of indigenous designs on the plain surfaces of the facial slices would not only enhance and cause aesthetic sensations in

the eyes of viewers but also promote and preserve the rich cultural heritage of our beloved country, Ghana.

1.2 Statement of the Problem

A critical observation of the building industry reveals that most Ghanaian buildings do not have a facial tile or slices as finish. Mostly, the buildings are finished by plastering with cement and painting, and others too with tiles of different make. The few tiles and slices used are plain. The use of tiles or slices as a facing finish is burgeoning in our building industry since it has aesthetic qualities and very durable if well executed. However, most slices or tiles found on the Ghanaian market are imported and mostly in porcelain, it is very expensive and unaffordable to the ordinary Ghanaian. Moreover, the slices found on the market are very plain and therefore devoid of aesthetic appeal.

It is in this backdrop that this project seeks to come out with facial slices using our readily available local materials such as clay and manganese. The project also seeks to incorporate indigenous designs on the slices produced not only to add to its aesthetic look but also to promote Ghanaian cultural growth and affordable to the ordinary citizen.

1.3 Objectives of the Study

The study seeks to address the following objectives:

1. To identify local ceramic raw materials suitable for the production of facial slices.
2. To generate designs from traditional motifs to give an aesthetic look.
3. To produce facial slices using the identified local raw materials.

1.4 Delimitation (Scope of the Study)

The study was limited to Mfensi clay and Manganese from Tarkwa as the main materials for the body. Mfensi clay has a high temperature and its mixture with Manganese, as a flux will help sintering at a reasonable temperature. The project was limited to the plastic method of production and the generation of design from natural objects, traditional symbols and basic techniques of designing such as Sgraffito, incision, painting, stamping, embossing, marbling, sprinkling.

1.5 Definition of Terms

The following terms have been defined to promote the comprehension of this project report.

Aesthetics	The formal study of art, especially with the relation to beauty
Air bubbles	Small pockets of air trapped in clay.
Antique	Artefacts or objects that have survived the ancient times till now.
Bisque	A ware fired once and unglazed.
Clay	Scientifically called hydrated aluminum silicate. It is kind of earth material soft and sticky when wet and permanently hard when fired.
Clay body	Mixture of clays and allied clay materials.
Design	A plan of work or a composition, organization and arrangement of work of art.
Embossing	A technique of decorating or creating motifs on ceramic ware to achieve a raised surface or relief effect.
Engobe	A layer of slip applied to ware to change the colour of the body.
Facial Slices	Pieces of building materials which are tile-like with a brick dimension of about 1 -3cm thick used to decorate buildings.

Finishing	A method in ceramics of treating the surface of ceramic ware.
Firing	A process of drying clay products by the use of kiln or open fire.
Green ware	Clay that has not been bisque fired.
Indigenous	Concepts and ideas that pertain to an ethnic group, a region or country before the advent of foreign influences.
Kneading	A technique of working on clay with the hand to remove pocket air.
Marbling	A technique in spreading engobes on ceramic ware to let the slip meander into one another.
Sgraffito	The decorative process which employs a scratched line through a layer of slip to expose the clay body beneath.
Symbols	Representation in form, figure or anything to convey a message to those who come into contact to it.
Slip	A fluid suspension of clay or other materials and water.
Single firing	A firing cycle in which the normal bisque and glaze firings are combined.
Slab Construction	A hand building method in which forms are created by joining flat pieces of clay. The pieces are thinned and flattened with a rolling pin or slab roller.
Warp	Distortion of a ceramic ware in drying because of uneven wall thickness or a warm draft of air or firing when a kiln does not heat uniformly.
Wedge	Kneading plastic clay with the fingers and heels of the hands in spiral motion, which forces out trapping air pocket and develops a uniform texture.
Motif	They form the main part of a design incision.
Sprig	Applying clay in a plastic state to form a relief decoration in a mould.

Leather -hard	Clay which is dried sufficiently to be stiff with very little moisture.
Test tiles	Small tiles made of clay used to test clay bodies in the kiln or sometimes glaze on a specific body.
Wedging table	A table of concrete on which clays can be wedged.

1.6 Abbreviations

BRI	Building and Road Research Institute
P.O.P	Plaster of Paris

1.7 Importance of the Study

This study would be of importance to the building industry, educational institutions offering ceramics, ceramic companies and producers of building materials. It would furthermore serve as a body of knowledge and a source of reference material to researchers, ceramic teachers and students as well as manufacturers. The study also plays a distinctive role in providing sweeping varieties in decorated facial slices to the public and possibly enhances the aesthetic nature of the buildings.

1.8 Arrangement of the rest of Text

Chapter one of this project report introduces the study. It entails the statement of the problem, objectives of the project and delimitation. It furthermore contains the importance of the study, definition of terms and abbreviations used. Chapter Two of the project is devoted to the review of related literature. In this chapter, scholarly writings on the project matter have been reviewed and discussed.

The third chapter is devoted to the tools, materials and equipment used, and captured the methodology of the project. It highlights and explains the various research

methods, data collection instruments, and method used in the study.as well as the experimental procedure, interpretation of results and production of facial slices. It describes the systematic procedures followed in creating each of the works. Chapter Four does a thorough discussion of the results of the project. Chapter Five summaries the salient points upon the results arrive at, and an informed conclusion and beneficial recommendation offered.

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CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Overview

This chapter presents to the reader literary materials on the project topic that has been executed already by other ceramic artists and writers. These pieces of literary information have been accepted for this chapter because they have a bearing on art and facial claddings, especially the building industries where tiles and facial claddings form an essential part. The information obtained from literature has been critically analyzed, in appreciation of what other writers and artists have produced in relationship to the project topic under discussion. In the process, shortfalls noticed from previous writings have been rectified.

The review has enabled the researcher to fill up some academic vacuum that has been created by some writers in respect to art and symbols. The information has helped to compare the finish and appearance of what is on the market. Furthermore, this literature has been advantageous because, apart from the vacuum identified, it has enabled the researcher to feed the academic world and the building industry with new ideas of indigenous concepts.

2.2 Origin of Clay and its formation

Clay is a material that abounds in our environment, plastic in nature that could be moulded into any shape and form. Rado (1988) stated that “the most abundant, ubiquitous, and accessible material on the earth’s crust is clay”. According to the writer, “Man was constantly been in touch with clay and after heavy rains, clay left his footprints, he found he could shape it with his hands”. Two writers Nelson and

Burkett (2002) remarked, “Clay is a common but unique substance that makes ceramics possible.” These writers furthermore argued, “Clay should not be confused with soil-a combination of clay, sand, humus (partially decayed vegetable matter) and various other materials”. It could be noticed from the submissions of the various writers that without clay it would be impossible to have ceramic art since it is the chief material for the accomplishment of the various artefacts found in ceramic art.

Clays being the most important material is made up of different minerals that make up the crust of the earth. Feldspar, ferro-magnesium group, quartz, Biotite, Titanium minerals form the major aspect of clays. Clay derives from the disintegration of feldspathic minerals commonly found in granite and feldspar, are made up of alkaline elements (Sodium and Potassium primarily), in molecular combination with alumina and silica. As these rocks decompose, they are broken down into smaller combinations of alumina and silica particles, as the alkalis in the rock are slowly leached from the stone.(Nelson and Burkett, 2002).The points made by these writers also find expression in Rhodes (1972) that “feldspar is by far the most common mineral, and it is the decomposition of this material which largely accounts for clay”.

2.3 Clay Deposit in Ashanti Region

Kessi (1989) stated in his findings, “Clay is in abundance in every region of Ghana.”From the book, the writer stated the various clays in the country and quantities in life span. Below is a table of clay deposit in Ashanti.

Table 2.1: Sites and Deposits in Ashanti Region

Area	Location	Reserve in metric tonnes	Approx. Life span (in years)	Possible usage
Kumasi	Womasi	164 570	6	Brick and tile
	Kasi(Tuante)	1086 993	34	Brick and tile
	Sisai	113 400	4	Brick and tile
	Kokobriko	21 061	1	Brick and tile
	DichemValley	81 000	3	Brick and tile
	Aboabo	162 017	5	Brick and tile
	Dichem-aprapong	162017	5	Brick and tile
	Satang No 1	32 400	1	Brick and tile
	Satang No2	396 548	5	Brick and tile
	Mfensi	396 548	13	Brick and tile
	SubinValley	162 900	6	Brick and tile
Obuasi	Asokwa	33 865	1043	Brick and tile ceramics
Nkawie	Aferi	955	64	Brick and tile
	Jankoba	2 055 900	5	Brick and tile
	Ahtawsu(mpasati)	139 999	4	Brick and tile
	Awrenfena	100 560	9	Brick and tile
		268 801		

Source: Kesse (1985)

2.4 Facing Tiles, Slices and Decorated Tiles

Facing tiles or bricks are specially made to serve the purpose of giving an attractive finishing look, and protecting the elements in buildings. According to Payne (1997), “facial tiles in general are said to combine attractive appearance with structural strength and good resistance to weathering”. Slices and tiles should be noticed as a high quality and attractive building materials. For this reason, they are used in highly visible areas of structures such as the interior or exterior walls of houses.

According to an internet source (www.historyoftiles.com), “decorative tiles were invented in the near east, where it had enjoyed a longer popularity and assumed a greater variety of design than anywhere in the world.” All methods of tile decoration were brought to perfection in Persia, during the Islamic period. The decorated tiles included unglazed ones in which the colours were limited to the natural colours of the clay, ranging from light sand to a red brick. Again, according to the internet source, (www.historyoftiles.com), “there is also the Encaustic or inlay method, to fill the matrix of a stamped tile with white pipe clay, before glazed and fired. The two sections fuse during firing”. There was also the mosaic type of decorating the tiles. Memmott (1972) has it that, “from the making of tiles, it presents many possibilities of design to the potter”. Interesting effects were created with glaze, using the glaze to convey the design. These were for mass effect or spot decoration. Their surfaces were for functional purposes such as top of tables and tiles. Textured surfaces were easy to make and used in many ways.

To the present researcher, all these methods mentioned above done, were to protect them from the weather. However, facial tiles or facial slices are devoid of the use of indigenous designs to give aesthetic look, which would stimulate and cause aesthetic sensations in the eyes of the viewers. It is one of the noted gaps of the present researcher, to come out with facial slices with indigenous designs on the surface.

Hamilton (1978) states that, a “There are different ways of producing tiles”. Traditionally, tiles were limited in size so the handling was easy. Any slight malformation in one tile would not entail remaking the whole design. He goes on further to say that, “the Surface of the tile may be modified by hand modeling to produce is decorative surface”. The simplest technique involved repeatedly pressing

hard objects such as modeling tools into the clay tile so that a systematic pattern was produced. The writer concludes that, “The simplest technique involves pressing hard objects into the clay, using stamps or roulettes. In most advanced countries, they used dust press method while in some developing countries; the plastic method or hand modeling are used as captured by Hamilton, to produce facial slices or facial tiles.

2.5 Slice Production in Ghana

In Ghana, only Ceramica Tamakloe's factory is into large quantities of slice production at Dodowa, in the Dangbe West. An interview with the Chief Executive Officer (CEO), Mr. Tamakloe revealed that, his production started in the early 1980's with ceramic wares like coffee, tea and other decorative pieces. Slice production began in 2002 about eight years ago. According to the CEO, initially purchasing of machines and employing engineers to service the equipment was a herculean task. It laid bare the fact that, he had to fall on an engineer who was a good friend from South Africa, to help him to assemble the machines and put them into production conditions. The factory employs both gas and electric kilns in the firing of their products. They are able to produce between ten thousand to twenty thousand (10,000-20,000) pieces a day and packed.

The chief material clay was dug from Dodowa. The factory uses the dust press method of production. The materials are ground, sieved and about five percent of water added. This is agitated to achieve a homogenous mixture. The mixture is sent through the hydraulic press for pressing. The products are sent through the continuous kiln for firing.

Vicalex is another company at Mfensi producing on demand. Mfensi clay is the material they use. An interaction with the General Manager (G.M) Mr. John Asare

also revealed that, slice production goes on but on demand. Unlike Ceramica Tamakloe, Vicalex use the plastic method for production. They have a machine for both mixing and cutting of the product. They rely on the natural air in drying their products, under a shed in the open. Clamp firing is used in the firing of their products. They are able to produce about 400-1000 a day depending on a good weather.

At BRRI, an interview with their production manager Mr. Rexford Brobbey revealed that, they are not into large-scale production, but on demand. Production is in the plastic method and is manual. In drying the products, natural energy (air) was used under sheds in the open. They use the palm kernel nut and dirty oil to fire their products in the kiln.

2.6 Slice Products in Japan

INAX, a book title of one of Japanese Ceramic Companies stated that, Japan has the most experienced manufacturing companies producing slices for their country's use. Most of their buildings are finished with slices. Slices produced pass through different methods yet in a single firing production and within some few hours. Many slices could be produced in bulk because of the method employed in production. Some slices mounted on a rail, while others fixed with the fixing cement were also available. The method of production of slices and tiles are the same, the difference lies in their sizes. Different types made were mostly of porcelain, stoneware and bone china materials, fired to a higher temperature between 1600- 1800, to bring out their unique colours, as in plates 2.1-2.9 below.

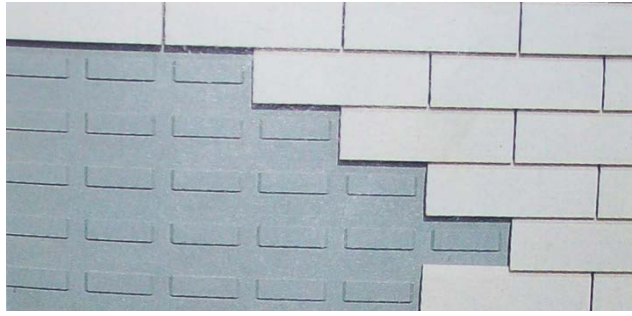


Plate 2.1: Some ash porcelain coloured slices mounted on rail.



Plate 2.2: Light brown porcelain colour.



Plate 2.3: Mattybrown colour of slices.



Plate 2.4: Light brick red colour.

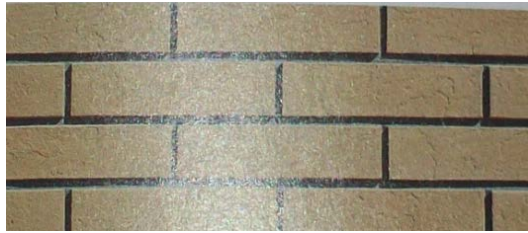


Plate 2.5: Buff/Creamcolour.

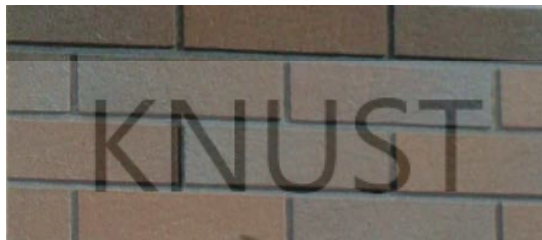


Plate 2.6: A mixture of brick-red and grey

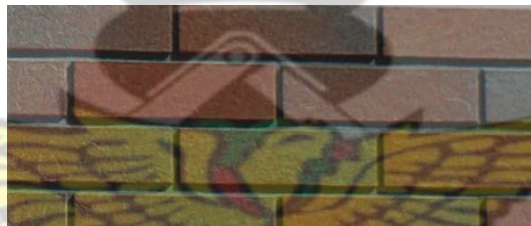


Plate 2.7: Decoration of brick red and grey



Plate 2.8: A rough textured wall of slices



Plate 2.9: A completed house with facial slices as a finish in Japan

2.7 Slice production in United Kingdom

According to Owusu et al. (2008), a natural addition to the extensive Ruabon range of Welsh clay products is new facial slices. The product was developed specifically for the requirements of cladding systems manufacturers and installers in Europe. It was fast becoming the number one choice for panel, archway and pre-fabricator chimney application.



Plate 2.10: Ruabon Facial slices.

Manufacture to exacting floor tile standard far exceeds the technical specifications of similarly priced brick -slices. Available in full and half-modular sizes, of 215mm x 65mm x 15mm and 102.5mm x 65mm x 15mm in ranges of natural to earth tone shades. Mitered tiles were also available for corner applications as evident in Plate 2.11



Plate 2.11: Ruabon facial slices in full and half.

Each facial slice is fully frost resistant with very low water absorption and highly resistant to staining. The slices exhibit exceptional durability with remarkable resistance to deep abrasion. The edges are chamfered on all four sides with no sharp or ragged edges, to provide a superior finish and ease fixing and finishing of joints.



Plate 2.12: Ruabon facial slice in full, half and chamfered.

Accurate dimensions give regular and even spacing of units and fixing ribs on the reverse side ensure secure and permanent adhesion. With negligible thermal and moisture expansion, they were designed to withstand the extreme climatic conditions.



Plate 2.13: Ruabon facial slices with different colours.

All the slices in plates 2.11-2.13 are examples of facial slices of different shapes made by Dennis Ribbon Tiles Ltd. in the United Kingdom. From the information gathered, on all the various productions and finishing methods, the researcher produced slices that would withstand the climatic conditions of Ghana with standard thermal shrinkage, moisture absorption.

2.8 Concept of Design

One of the philosophies of this project is that slices found on the market are devoid of that aesthetic look. For a slice to attain such quality there is the need for careful planning and a good concept of design. For a work to be classified as a good work art by connoisseurs means that, the artist was able to apply the various principles and elements of design.

Memmott (1972) stated that, “design is a personal taste, which grows. It expands its knowledge gradually from the obvious local conceptions to an understanding of historical work from primitive times until today”. Furthermore, he asserts that, “When considering design, return to nature for ideas. If design is functional, consideration will be where the object is to be used. Design expression should be natural and unforced, within the capability and understanding moment”. The researcher agrees with the writer that, ideas got from ancient times as well as our natural environment, is the best source of design. Some things of nature were used for the design by the researcher.

Cohen (1985) argues with the assertion that, “the conceptualization stage is where the designer generates ideas on the design to meet the functional requirements of the artefact to be designed. The background knowledge and creative skill of the designer play a very important role at this stage. Instead of putting the ideas on the paper, it could be put into a computer using appropriate input devices. At the conceptualization stage, the computer is not only used as a medium to store ideas but also it is made to respond to the ideas that help the designer”. Here, the researcher agrees with Cohen (1985) that, it is important to bring ideas into computer to respond to designer’s help. With this, most of the researcher’s designs were done with the aid of a computer. Jones (1970) gives what he regarded as the “ultimate definition of design” To initiate change in man-made things”. Thus, the researcher defines a design as the creative manipulation of ideas from around with a unique touch with the aid of a computer.

Lawson (2000) asserts that, “design has both a noun and a verb and can refer to either the product or the process”. He further stated that, “design has become an objective rather than a noun. He further explains that, “design is a generic activity, yet appear to

be of real differences, between the products created by the designer in various domains.” Furthermore he stressed that, “design is a highly complex and sophisticated skill that is a mystical ability given, only to those with recondite powers but a skill which, for many, must be learnt and practiced rather like playing of a sport or musical instrument”.

Encarta (2005) states that, “design as a conscious activity, guided by aims and objectives, refers to planned and organized actions intended to bring about some predetermined outcome although there may also be accidental or unexpected results”. It clearly reveals that before one produces a design, the item, artifact or product to be executed should be pictured or perceived in mind.

Lawson (2000) further explains, “Design activity usually displays expertise knowledge, creativity and thoroughness. It has a close relationship with technology, human needs and aesthetics. Models or prototypes such as drawings or constructions allow problems to be explored, ideas to be visualized and intentions to be communicated”. These in turn facilitate feedback from a variety of sources such as users, manufacturers or other members of the design team. From this concept, the researcher made some models to communicate her ideas to users.

Dennis and Jenkins (1991) delineated layout as “the arrangement of all the units or elements into a printed usable format”. The writers reiterated that, “layout is a design for the overall appearance of a printed page, with particular emphasis on the effective positions and arrangement of page elements. Since every trade has its rules and principles”. Marshall (1984) suggests four basic principles namely: “proximity, alignment, repetition and contrast”. These principles are the fundamentals for every designer. The principle of repetition can be related to the element principle of rhythm.

In this vein, Ruher (2002) suggested that, “repetition of visual elements throughout the design unites and strengthens a piece, by putting together or otherwise separating parts”. The researcher finds expression with the writer that repetition is very useful on a design piece or in multiple designs work of art.

Designs and decorations are made on slices for several reasons. Everret (1979) opined, “decorations may be required to protect surfaces from rain, sunlight, abrasion, chemical liquid and fumes, micro-organisms for hygiene to reflect or diffuse light to provide colour or pattern to define areas usually or absorb sound”. Kenney (1963) hammers that, “The world is filled with forms. There are forms of growth and life i.e. the patterns we find in living shells, fruits and flowers. This form of decoration the researcher agrees is possible to use in the production of slices.

Rottenberg (1972) spells out that, “An object made of clay offers an impelling invitation to surface enrichment. Its purpose is to enhance the form so the two make a unified convincing completely, rather than a static shape with decoration imposed upon it. Surface textures are suitable and inviting or badly vigorous when they sometimes suggest and other times emphasize a configuration. Arrangement of patterns and colours often repeat illusory, fragments of details of the form. On the tactile surface of a wall conceived ceramic object, these abstractions or echoes of reality make convincing design”. The writer concludes that, “The chunkiness of a bold ceramic relief can aesthetically extend abstract forms of architecture and enhance plain walls with form, texture and colour”. This the researcher finds it essential and employed texture and colour to her work.

2.9 Some Ghanaian Symbols

A school of thought states that, “symbols are representational in graphical, ideas, emotions, and abstraction in place of realism”. Akrofi, as cited by Howard, (2001) states that “Symbols are multifunctional in nature. They are appreciated for both artistic and communicative values. They are mostly non-verbal instruction of proverbs, parables, and maxims and they portray the philosophical particular thinking and the way of life of a particular group of people.”

Akrofi’s statement shows that symbols give graphical representation of sayings. The researcher supports this with one of the Akan symbol, which is “Akoko nan tia ba na ekumba. Literally means that” the hen trades upon its chicks but does not kill it. This means that children are being corrected by parents but are not harmed when corrected”. A personal communication with Egya Nyamekeh Mozu on 24 September 2007 says that, “symbols were only for communicative values since all that a symbol represents could be proverbial, representational” as stated by Howard from Akrofi’s research. The symbols could also serve as a teaching aid to all in societies. The incorporation of indigenous Ghanaian symbol as motifs for the actual design of the writer’s work was used.

CHAPTER THREE

METHODOLOGY

3.0 Overview

This chapter is devoted to the methods for the research, tools, materials and equipment used in the execution of the project. It also includes the generation of designs from traditional symbols, preparation of clay bodies and production of the facial slices.

3.1 Materials

Slip: A suspension of clay in water used in joining and decorating.

Engobe: A prepared slip that is halfway between glaze and a clay. It contains feldspar, flint, a flux plus a colorant. It was applied to the damp slices although it may be used on bisque ware as in.

Mfensi Clay: This was the main material for the production of the slices. It is obtained from Mfensi in the Nkawie district of Ashanti along the Sunyani road

Manganese: An earth material, which is solid and black with crystals, obtained from Tarkwa the mining area in the Western region of Ghana

3.2 Tools

Brushes: These were used for to brush over the surfaces of some of the slices the green ware state.

Knife: General purpose tapered knife for cutting soft and leather hard clay into slices.

Spatula: This is a wooden diagonal blade with round thumb end for removing excess slip from the slices during embossing.

Cutting wire: This tool is for cutting soft clay into bits before wedging.

Fork: This was for scouring the surface of the slices before slip is applied.

Foam: Synthetic sponge for cleanup of excess slip and for finishing slice work, or leather hard work slab work.

Hacksaw or Serrated rib: Flexible metal rib for scraping, scoring the back of Slices in leather -hard and dry clay.

Guide sticks: These are centimeter width sticks long enough to guide the clay when being rolled for even thickness.

Scrapper: used to cut through the leather hard rolled slab into shape of slice sizes.

Trowel: used to flatten the surface of the slices after they had been cut to make the surface so smooth and neat.

Heavy stick: This tool was used to beat the slices into actual size.

Stone: For creating textures on some of the slices.

Beam balance: For weighing the test tablet/pieces after being bisque and glost firings.

Sack board: A wooden board covered with a jute fabric was used to prevent clay from sticking when rolling.

Rolling Pin: This is a cylindrical wood with handles at both ends. Used for rolling clay into slabs of equal thickness with two guide stick

Mesh: A sixty-size mesh was used for sieving the materials for the experiments

3.3 Equipment

Pug mill: The machine used to blend clay and manganese into a moist, workable

Ball mill: A rotating porcelain jar filled approximately half full with flint pebbles or porcelain balls that revolve and grind dry or wet pigments into powder or refined liquid state. This is a machine used to mill engobes in its right consistency to be

smooth. The machine has a container with pebbles was used to mill the materials to a smooth consistency.

Weighing scale: This was used to weigh the materials for the experiment and also weigh the clay body.

Kiln: This was used to fire the slices after they were bone dry for both bisque and glaze firing of the test pieces

Pyrometer: This was used in measuring heat at high temperature. It consists of a calibrated dial connected to wire made of two different alloys, the welded tips of which protrude into the kiln chamber when heated, this welded junction sets up a minute electrical current which registered on the indicant dial device for measuring and recording the exact interior temperature of a kiln through out the firing and colony process

3.4 Research Design

This project employed the studio practical research method to execute its results successfully. This research method has been discussed in the following sections of this report. Under this research design, for the researcher to know what was produced outside the studio, interaction went on between the researcher and some producer which included BRRI, VICALEX, and CERAMICA.

3.5 Data Collection Instruments

The researcher employed interview and observation. To help the researcher know the right material to use, to what temperature, colour, the behavior of various materials, which design to incorporate and to build up a better conclusion for the work. An interview is a conversation between two or more people i.e. the interviewer and the interviewee, where questions are asked by the interviewer to obtain information from

the interviewee.”Interviews can be divided into two types, interviews of assessment and interviews for information. Interview is also a “face to face” meeting between a questioner and a respondent (Agyedu et al., 2005).

The researcher sought it expedient that in order to produce slices that can meet the standard of the product found on the market, there was the need to interview those that are into the production of facial slices. The various heads of the production unit of Ceramica Tamakloe, Vicalex and the Building Road and Research Institute were interviewed using a non-structured interview guide.

3.6 Observation

Observation is regarded as the most direct means of studying people when one is interested in the overt behavior. Observation is a natural way of gathering data for research. Data collected through observation may often be more real and true data collected by any other method. Actual characteristics of subjects observed give true and accurate answers to questions that may be asked. As a scientific tool, it may range from the most cause and uncontrolled to the most scientific and precise, involving modern mechanical and electronic means as cited by (Sidhu, 1984).

The researcher observed the production activities at the following centres, BRRI, Vicalex, and Ceramica Tamakloe. At Vicalex, the observation was that, their production was mechanized. Mfensi clay was used for production, drying was done under sheds, clamp firing was used and firewood as fuel for firing. This firing gives uneven distribution of heat. At BRRI, Hwereso clay is used and occasionally Mfensi clay. They used the palm kernel nut together with dirty oil in their firings. Manual form of production is the method used. At Vicalex, highly mechanized machines were used. Continuous kiln was used in their firing. They could produce ten thousand to

twenty thousand pieces a day and packed. In all, the observation at the production sites all lacked designs. They had no standards for production on absorption, strength and shrinkage.

3.7 Experiments

Various experiments were carried out in the Ceramics Laboratory to ascertain the suitability of the materials for the preparation of the slices. In all, great effort was made to record the results of the various chemical and physical tests made on the clay body samples. Experiments were conducted on the various identified materials, techniques prior to the commencement of the project to ascertain their suitability and effectiveness for the project. This was necessary to provide the researcher with concrete and in-depth information on which direction to take to achieve the objectives of the project.

It also deals with the various experimental procedures done to arrive at a clay body with its inherent properties, which is good for the production of the facial slices. Again, it also includes the preparation of engobes for the slice decoration. This statement is in line with what Ary et al. (1985) outlined that, “Experimental research method is a deliberately and systematically manipulation of certain stimuli, treatments or environmental conditions and observations of how the condition is affected or changed.

3.8 Generation of Designs from Traditional Symbols and Natural Objects

The word “design” originated from the Latin word “designare” which means to mark out the process for developing plans or schemes. Particularly, a design may be the developed plan or scheme whether kept in mind or set forth as drawing or model. It is

a means of arranging visual emotional experience to give unity and consistency to work to enable the viewer to comprehend the meaning.

One of the objectives of this project is to develop designs from some traditional symbols to add to the aesthetic qualities of the facial slice produced. For this reason, some traditional symbols were randomly selected and developed into unique designs. Among the traditional symbols (*adinkra*) compiled by Ablade Glover were *dweninimmen*, *Aya*, *akoko nan tia ba na nkum ba*, *mate masie*, *pempamsie*, *nyame soro*, and Agbo's agama (*Domedzadzarado*). The *adinkra* symbols chosen were scanned onto the computer. Corel Draw Adobe Photoshop was used in manipulating the designs to the taste of the researcher. Care was taken in resizing the designs to fit the surfaces of the slices. This was important since the researcher bore in mind that, for a work to be classified as a good work of art, the design must not cover the entire surface.

In addition, in generating the designs, the interplay of dots, lines, shape, texture and colour was done in conformity with the principles of design such as rhythm, balance, unity, dominance, repetition, contrast, harmony and variety where necessary to achieve a good result. The researcher generated both abstract and semi-abstract designs mostly from natural objects of tree bark, rock, and sprinkling. Abstract ideas from existing symbols were also developed. The figures below show how the various *adinkra* symbols were developed.

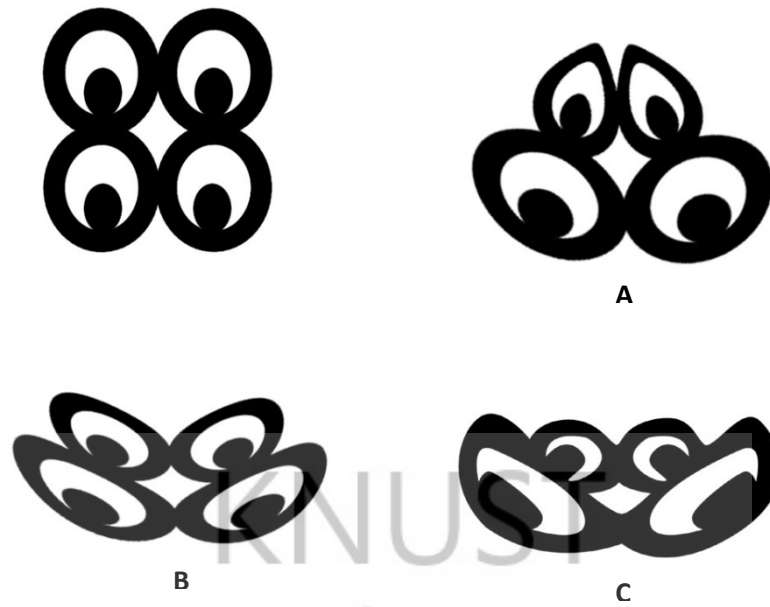


Figure 3.1: Development of mate mesie design (A and B) and final design (C)

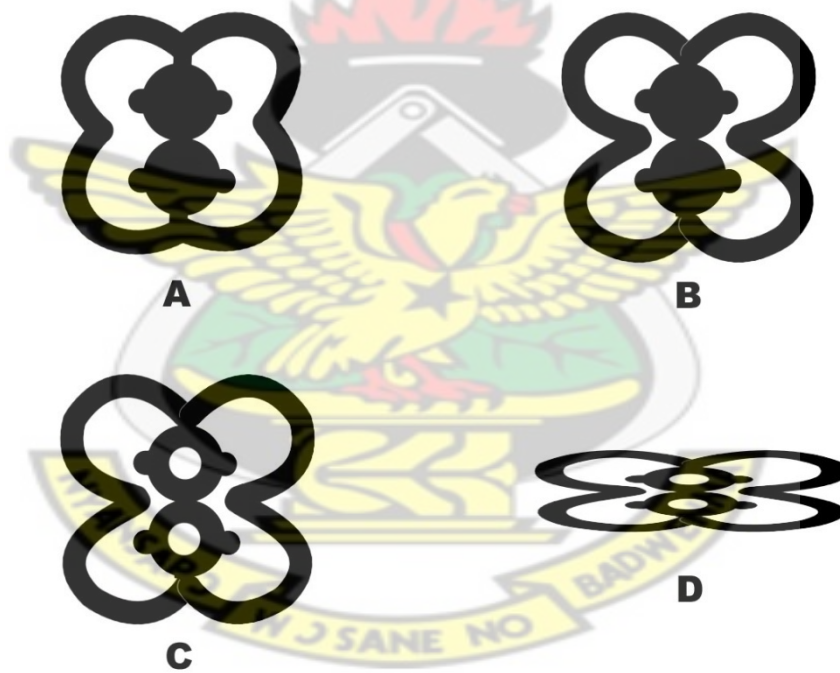


Figure 3.2: Development *Domedzadzrado* into (A, B, C) and final design (D)



Figure 3.3: Development of claws *akoko nan tia ba nan kum ba* into design (A, B, C) and final design (D)

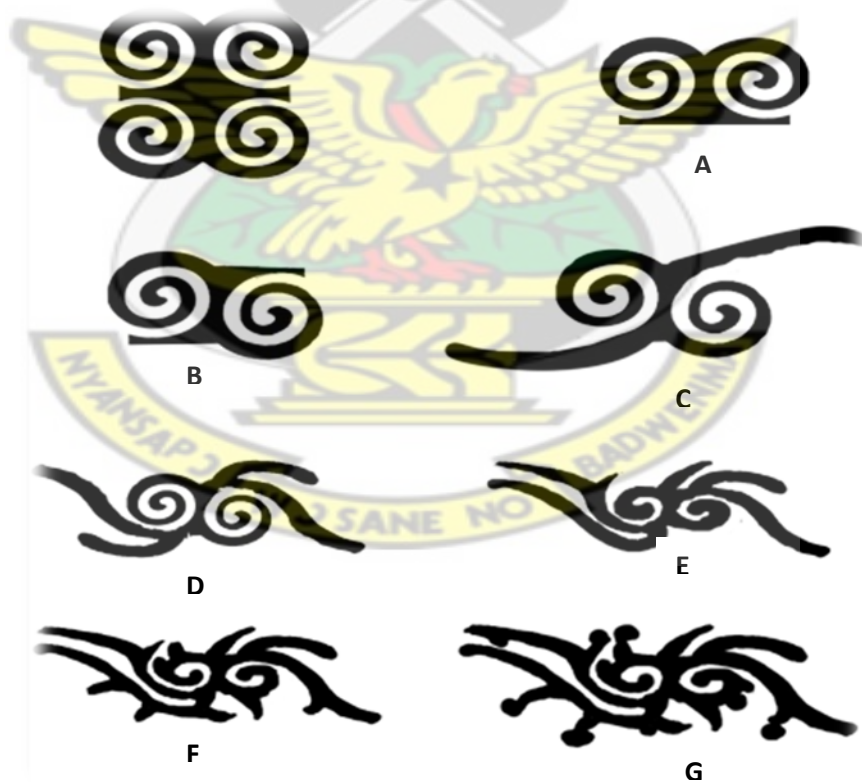


Figure 3.4: Developing designs from Adinkra *dwenini mmen* design into (A, B, C, D, E, and F) and final design (D)

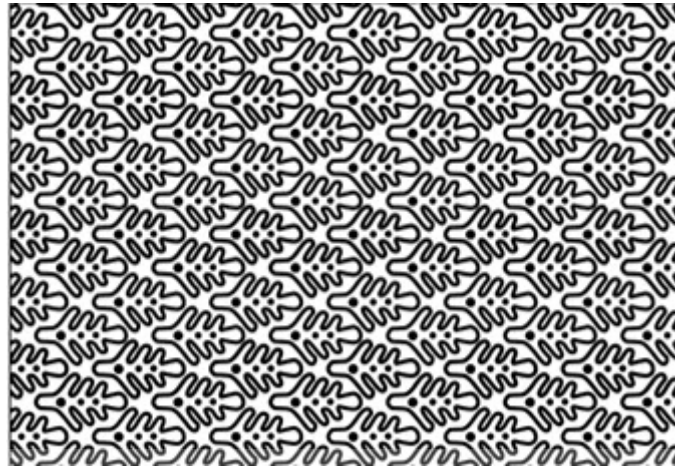


Figure 3.5: Design development from *adinkra Aya*

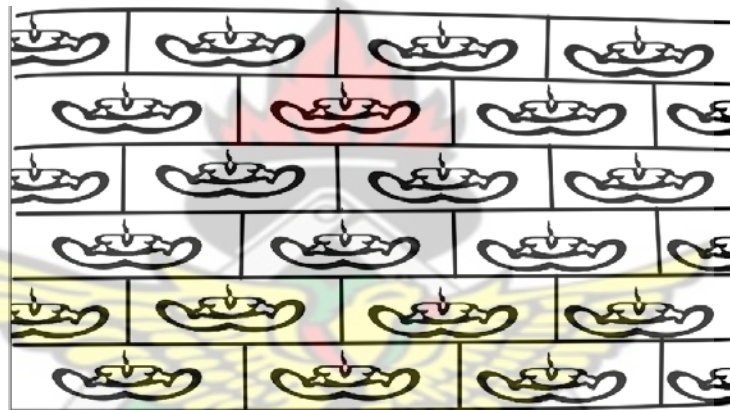


Figure 3.6: Developed design from *Adinkra pimpamsi*



Figure 3.7: Brush shading effect by researcher

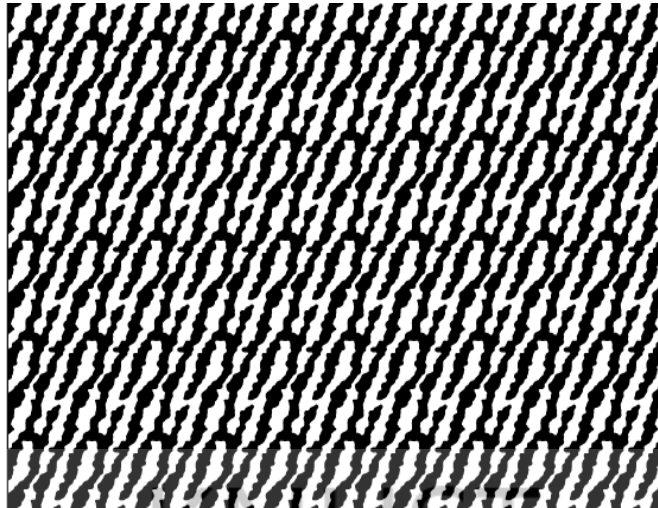


Figure 3.8: Tree bark texture by researcher

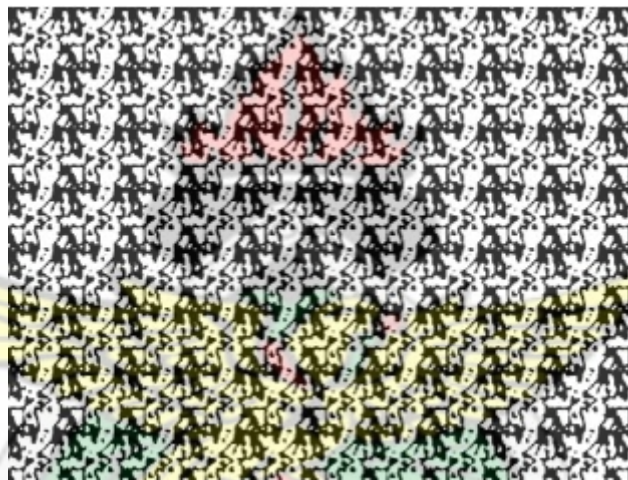


Figure 3.9: Designs from irregular textures

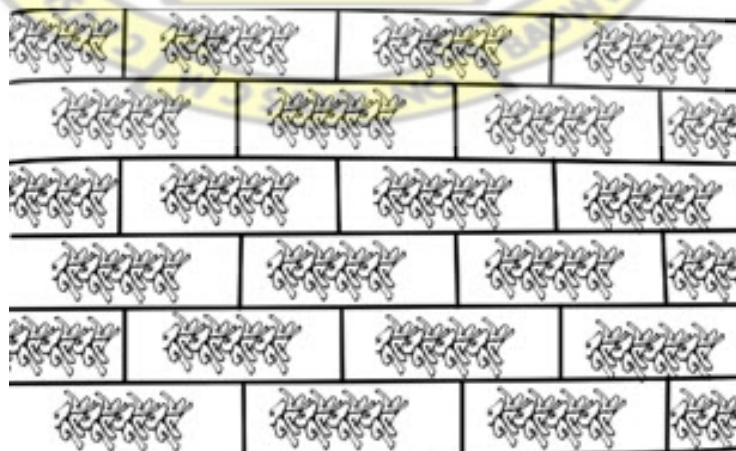


Figure 3.10: Designs developed from (*adinkra*), *nyame biribi wo sor*



Figure 3.11: Designs developed from nature (tree bark)

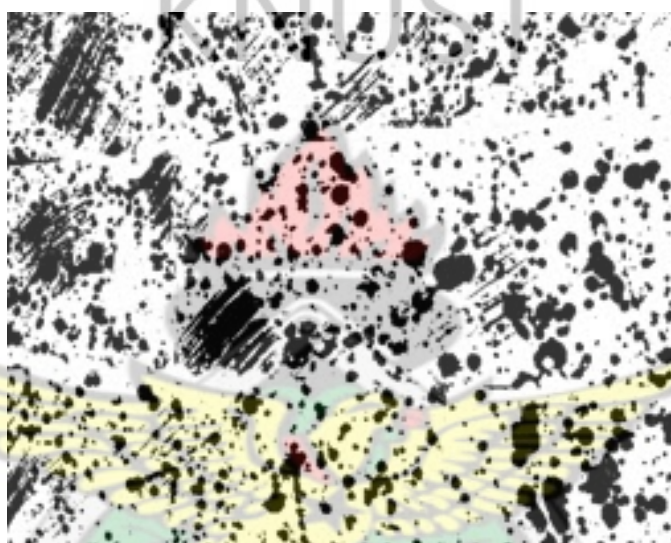


Figure 3.12: Preparation of wooden Template

Due to the different methods used for the decorations, the researcher produced templates for some of the decoration work. A hard wood with a dimension of 3" x 9½" was cut and designed as the template for stamping and embossing. The designs were carefully traced onto the wood and the design beautifully cut out with a hacksaw.

3.9 Preparation of a P.O.P Mould for Template 2

Another template of P.O.P mould was made for embossing the final design of fig. 5.2 (d.). The 600 grams of Plaster of Paris in its powdered form was poured into 40ml of water in a bowl. Setting was done and allowed to harden. It was shaped into a

rectangular block of 10" x 4" x 2". The design for the mould was transferred by tracing it a pencil. A knife was used to cut the design out as in Plate 3.1a to 3.2a respectively.

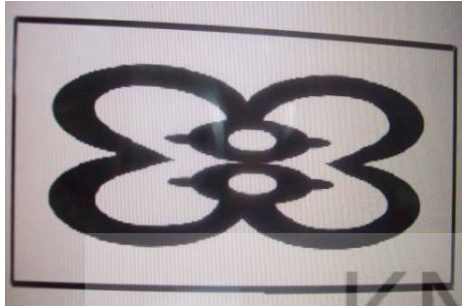


Plate 3.1a: Sheet with design to be traced. Plate 3.1b: cutting design on P.O.P mold



Plate 3.2a: Scrapping of P.O.P Mould Plate 3.2b: Final Mould

3.10 Preparation of Tracing Sheet

The Adinkra symbol “Akoko nan tia ba na nkum” was abstracted. With the help of the computer, using coral 12, the shape of the claws of the fowl was drawn, arranged and re-designed using the computer options as evident on figure 3.3. Three sets of the claws were drawn, redesigned and finally stretched onto a rectangle of the slice size (3½ by 9½) on a computer. Final image was printed on an A4 sheet. The design was traced using a tracing paper to be finally transferred onto the slice.

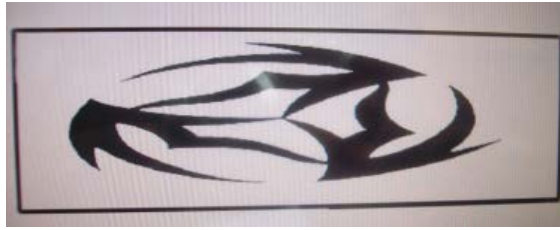


Plate 3.3: Tracing sheet for Sgraffito

3.11 Design for Incision Work Preparation

The researcher prepared the design for incision work from an *Adinkra* symbol *mate masie*. The design was manipulated using the computer until the desired results was achieved. The desired design was stretched to a size of 3½" by 9½" on the computer and printed. The printed designed was later traced on a tracing sheet in order to duplicate on the slices as seen in plate 3.4



Plate 3.4 Design on sheet for tracing incision work.

3.12 Physical Analysis Test on Mfensi body clay (Mfensi and manganese)

2000grams of Mfensi clay was sloped in 5.0 litres of water for 24 hours to form slurry. The slurry was then sieved through a 60-mesh sieve. There residue obtain was air dried and weighed. The weighted dried residue weighed 140grams. The percentage residue of clay sample was calculated using formula (F).

The sieved Mfensi clay was decanted after 24 hours and transferred into a plaster of Paris mould (P.O.P) to remove excess water. The clay was put in polythene bag for two (2) days to age thus improving on the plasticity of the clay.

The aged Mfensi Clay was kneaded to remove air, after which Manganese was added to form a body composition. The bodies composed were aged for seven (7) days. This was prepared to check, shrinkage, warpage, porosity, strength and, change of colour, with improved workability. Different bodies of varying proportions of Mfensi and manganese. Five compositions were made and dried. The compositions were in the following proportions:

Body A is 95% of Mfensi clay and 5% of manganese

Body B is 90% of Mfensi clay and 10% of manganese

Body C is 85% of Mfensi clay and 15% of manganese

Body D is 80% of Mfensi clay and 20% of manganese

Body E is 75% of Mfensi clay and 25% of manganese

With the aid of a sack board and rolling pin, together with guard sticks, Slabs were flattened. Five pieces each, of the various bodies measuring $7 \times 4 \times 1 \text{ cm}^3$ were obtained with the aid of a utility knife. Marks of length 5.0 cm were inscribed horizontally on each slab. The slabs were then left to dry after which the dry shrinkages recorded as in table 4.1. To avoid warpage during the drying process the slabs were repeatedly and carefully turned over. The leather hard slabs were fired to 1000°C and 1150°C respectively and their firing shrinkages recorded.

3.13 Calculation of Dry Shrinkage, Fired Shrinkage and Water Absorption

To determine the dry shrinkage, fired Shrinkage and water absorption at the two different temperatures, bisque (1000°C) and a second firing of 1150°C and results recorded, the following formulas were used in the calculation. The shrinkage is caused by the emission of water of plasticity from the clay tablets. The tables at page detail the various shrinkages of samples of Mfensi clay body.

$$\text{Percentage drying shrinkage} = \frac{\text{Plastic length (wl)} - \text{Dry length (dl)}}{\text{Plastic Length (wl)}} \times 100 \dots\dots\dots \text{F1}$$

$$\text{Percentage Firing Shrinkage} = \frac{\text{Dry length (dl)} - \text{fired length (fl)}}{\text{Dry length (dl)}} \times 100 \dots\dots\dots \text{F2}$$

$$\text{Percentage water absorption} = \frac{\text{Saturated Weight} - \text{Dry Weight}}{\text{Saturated Weight}} \times 100 \dots\dots\dots \text{F3}$$

$$\text{Percentage of residue of clay} = \frac{\text{Plastic length (wl)} - \text{fired length (fl)}}{\text{Plastic length (wl)}} \times 100 \dots\dots\dots \text{F0}$$

3.14 Production

Plastic Method

There are two methods in producing facial slices namely the plastic and dust press methods. Since there was no machine to do the dust pressing, the project employed the plastic method of production. Although, the manual plastic method was realized to be tedious, it was easy to manipulate to achieve desire designs.

Step 1: Preparation of the clay body for work

Clay was mixed with 25% of manganese with suitable amount of water. The clay was pugged in a pug mill, with manganese gradually poured unto clay to mix in the miller. Clay after pug milling was covered with heavy polythene bags enable the body to age well for the work. This is to allow even distribution of water, and breaking down of particles that were not well mixed to have a good consistency.

Step 2: Kneading of clay

Clay was cut into bits with a cutting wire to enable the researcher handle and knead clay to remove unwanted air bubbles and to enable the manganese to be evenly mixed with the clay.

Step 3: Rolling of clay

Kneaded clay was spread on a rolling board, and rolled to a thickness of 5cm with a rolling pin.

Step 4: Cutting

Rolled clay was cut into 22.86 x 8.89 x 5.08 cm for the full sizes slice and 11.43 x 8.89 x 5.08 cm for half size using a knife.

Step 5: Drying

Cut sizes of rolled clay were spread on the bear cemented floor to enable moisture to drain, and left to dry to a leather- hard state.

Step 6: Beating and cutting

With the help of two guard sticks of 1.5cm thick, the leather-hard clay was beaten with a heavy stick to the thickness of guard sticks and re-sized with a template of wood for cutting the actual size of slices measuring 8.89cm x 22.86cm. The clay was placed on the working board and cut into size as in Plate 3.5. A trowel was used to smoothen the surface of the slice after beaten. One hundred and twenty (120) pieces of full size of the slices were produced whiles eighty (80) pieces of the half sizes slices were also produced for the final work.



Plate 3.5: Beating of slices to final size

3.15 Application of Decoration for Incision

As mentioned on the previous page, a design from an Adinkra symbol *mate mesie* re-designed into *obiara rehwe wo*. The design was carefully traced on the surface of the slices produced. A sharp knife and a lino cutter were used to cut into the groves of the outline of the design on the slices to bring out the design as in Plate 3.6.



Plate 3.6: Incising of design on slice

3.16 Application of Decoration for Embossing

Procedure

Step One

The Plaster of Paris mould was used for the embossing techniques. A reasonable amount of clay was pressed in the mould.

The clay registered the designs of the mould. It was trimmed and shaped as evident on Plate 3.7.



Plate 3.7: Design taken out of mould and trimming

Step Two

Fifteen full slices and six half slices were selected. The design was transferred onto the facial slices by scratching the back of the design and with the help of slip as a binder, was glued onto the surface of the slices. The same procedure was carried out on all the slices. However, with the half slices, a cut was made through the design into two from where the halves joined.

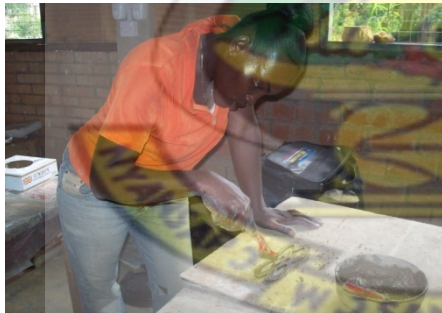


Plate 3.8a: Scratching the back of design of design with slip



Plate 3.8b: Brushing the back



Plate 3.8c: Putting embossed design over slices

Step Three

With the help of wet foam, pieces were smoothened on surfaces. Excess slip was also removed with a spatula as seen on plate 3.8d



Plate 3.8d: Taking excess clay from embossed work

Step four

A brush with white engobe was applied onto the surfaces of the slices. All the slices were packed unto a big hard flat wood and covered with a polythene sheet. This was to avoid warpage.



Plate 3.9: Embossed work assembled

Step five

The slices were left to dry under a controlled atmosphere. When work was leather hard, the polyethylene sheet was removed to allow the slices to dry very well for firing.

Step Six

Work was fired to temperature bisque of 1000 °C. After the first firing, the work was reassembled and a manganese solution applied. It was afterward fired to a temperature of 115 °C 0. The results are shown in Plate 3.10.



Plate 3.10: Final fired work

3.17 Decoration for Sgraffito

Sgraffito is a method of scratching onto the surface a design.

Procedure

Step One

Fifteen of the full and six of halves sizes assembled on a wooden board. White engobe was brushed over the surfaces of the slices with the help of small painting brush.

Step Two

The painted slices were left to dry controlling the method of drying. The work was dried under a polythene or rubber sack. The slices were left to bone dry. The design as shown in figure was traced onto the slices.



Plate 3.11: Assembled slices painted with white engobe

Step Three

After tracing all the design onto the slices, the design was scratched through with a small knife as in Plate 3.12. Work was then ready for firing. The sides of slices were smoothened with wet foam to give neat ends and assembled as in Plate 3.13.

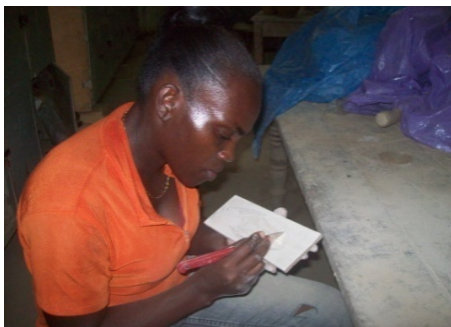


Plate 3.12: scratching through the design Plate 3.13: Scratched slice arranged

Step four

Work was fired to bisque (1000 °C) for the first firing and re-fired to 1150 °C.

3.18 Stamping

Stamping is a method of creating a design on a wood, or any firm hard surface and making an imprint onto another surface. Stamping in ceramics is a unique method. Usually the unique feature of stamping depends largely on the artist's mastery in the design.

Procedure I

Step 1

Some of the already beaten slices were assembled and arranged in half and full alternation.

Step Two

Wooden templates was used to stamped the surfaces of the slices. However, it was oiled in order to avoid sticking.

Step Three

With the help of a small wooden mallet, the design was registered unto the leather hard slices as in Plate 3.14



Plate 3.14: Stamped Work

Step four

Foam was dipped into the white engobe and gradually and lightly brushed over the pressed slices. This was then left to dry. A large polythene sheet was spread over the whole work and left to dry. This method was done to control warpage.

Step six

The slices were turned daily for even drying. The work got bone dried in a week and fired to bisque (1000 °C).

Step seven

After bisque firing, a manganese solution or suspension was brushed through the design to highlight it and re-fired to a temperature of 1150°C. The result is seen on Plate 3.15.



Plate 3.15: Final work, stamping

3.19 Design Application for Marbling

To create a ceramic slice with marbling the first thing to do is to think of a suitable design. This is because not every design would be suitable for marbling. Designs for marbling are mostly accidentals and abstract in nature. However, a much conscious effort might be employed to produce some realistic one. The predetermined design is usually conceived into the mind's eye. This is to say the design to be produced is most often imaginative where the design in the artists mind is produced directly onto the

slices. For the purpose of this project, the researcher produced designs based on the waves of the sea and splashes of water to achieve a unique result.

Procedure for marbling

Step one

Fifteen of the full slices and six of the half size slices and assembled them together.

Three different engobe (grey, white, brick red) were selected.

Step two

Facial slices were taken one after the other, and all the different engobes, spread on and turned gradually for each engobe to run into each other. This was repeated for the entire slices until all got finished.

Step three

The work was covered with polythene sheet and left to dry. This was done to control warpage of slices. When work was bone dry, slices were fired to for bisque (1000 °C). After bisque (1000 °C) firing, slices were re-fired 1150°C. The result of the work is as in Plate 3.16.



Plate 3.16: Final work for marbling

3.20 Decoration by Texturing

Texture is the nature of a surface. There are two kinds of textures actual and visual. Actual is also known as tactile. Actual or tactile is that kind of texture where you can feel it as either rough or smooth. Whiles visual is smooth and can be seen but not felt. This can be done by so many methods. A sharp knife, hacksaw blade and a scrapper created textures of the project.

Procedure

Step 1

As previously mentioned, the researcher took fifteen slices already beaten to the size of slices and arranged with its half and full size.

Step 2

The researcher took a ball of clay used for the slices and rolled it into slab and left to a leather-hard state.

Step 3

The researcher took a hacksaw blade and scratched on the surface of the rolled slab to give the crumpled effect of the tree bark.

Step 4

The researcher after so much scratching mix a thick slip and took the scratched pieces, put slip at the back and pressed them on the slices till they got filled up on each slice as in Plate 3.17.



Plate 3.17: Textured slices like tree bark

Step 5

All the slices textured were packed on a wooden slab and covered with a polythene sheet. They were turned daily until they were bone dry for firing.

Step six

Slices were fired to bisque (1000°C). After bisque firing, slices were brushed with manganese suspension and re-fired to 1150°C given it an antique effect as in Plate 3.18.



Plate 3.18: Final fired work for texture (tree bark)

3.21 Texturing with rough rock

As already mentioned, textures could be created by different kinds of methods. This particular one was done with the rock surface. A rough small stone was taken and rubbed on the surface of the slice to register the design.

Procedure

Step one

Fifteen slices of full size already beaten, six of half size slices were packed on a working table.

Step two

With the help of a meter rule and a pin tool, the researcher marked one (1) cm on both lengths of the surface of each slice. The measurements were done on all the slices both full and halved.

Step three

A rough surfaced stone was taken and in between the 1cm marked lines, textures were executed on the surface of the slices with the rough surface stone. All slices went through the same method.



Plate 3.19: Arranged work textured with stone

Step four

The slices were left to dry on the wooden boards and covered with a polythene sheet. After slices were bone dry, they were fired in the electric kiln to a temperature 1000 °C.

Step Five

After bisque firing, a solution of manganese was brushed over the fired slices. Excess manganese was brushed with wet foam to give it a lighter shade. Slices were re-fired to 1150 °C.

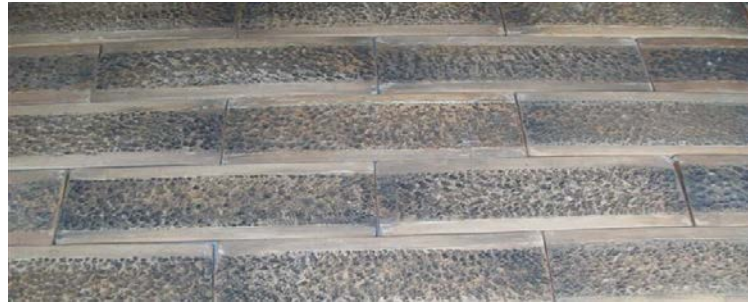


Plate 3.20: Final fired work for textured with stone

3.22 Irregular Incision and Multicolour Painting Decoration

Different stone pebbles of different small patterns are brought together to form a big pattern in decorating homes. It is worthy to note that in textiles it is normally known in our Ghanaian Akan language as *nsasrawa* which means different materials or objects put together to form one big material which could be used by an individual. Likewise, in ceramics such patches occur by creating different pattern units with colours to give that effect. In this slice production, the researcher incorporated such patterns in the slice production to give this traditional effect of pattern of production.

Procedure

Step one

As already mentioned, already beaten slices were selected. Both full and half sizes were brought together in an artistic arrangement. Patterns were drawn arbitrary on the slices and later incised with a linocutter.

Step two

The created patterns were also painted with the three different engobes and left to dry covered with polythene sheet to control warpage.



Plate 3.21: Incised multicolour painting

Step four

Work when was bone dry, they were fired to bisque (1000 °C).

After bisque firing, they were re-fired to 1150 °C. A result is as in Plate 3.22 below.



Plate 3.22: Final work for multicolour painting

3.23 Brushing & Sprinkling

The engobes were brushed on the surfaces of the slices using the brush. For diverse effects, the engobes were sometimes sprinkled onto the surfaces of the slices.

Procedure

Step one

Slices were assembled and arranged with its full and half sizes together.

White engobe was painted on the surface of the slices using the brush.

Step two

A grey engobe was brushed over the surface into patches. Another colour of brick-red engobe was brushed in between the already brushed grey engobe.

Step three

Soft brushes were picked and with the same colours of engobes and sprinkled on the surface of the already brushed slices as in plate.



Plate 3.23: Arranged slices with brushing and sprinkling

Step four

Work was left to dry openly without any polythene sheet to bone dry and ready for firing. Work was fired to bisque (1000 °C). After first firing, the work was re-fired to 1150 °C.

3.24 Sprigging or Roulette

A process where designs made on fired clay, metal, wood and other hard substances were rolled on a slab of clay to register the designs. Sprigging or roulette is an interesting method for reproducing cumbersome designs.

Step 1

Arranged fifteen of the full and six of the half size of slices. Rolled over a designed metal ball ring, on prepared slices, to register the designs.

Step 2

Assembled slices for drying. When bone dried, was fired to bisque (1000 °C).

Step 3

After the bisque firing, manganese solution was brushed over the fired slices for a second firing (1150 °C).

3.25 Brush Strokes

Brushing is a process of applying a brush. Brush stroke is the application of engobe with brushes to register brush strokes on the surface the slices.

Procedure

Step one

Arranged already beaten slices, full and halves sizes together. The three different engobes were on the surfaces of the slices.

Step two

Left to slices to bone dry and fired to bisque (1000 °C), later re-fired to 1150 °C.



Plate 3.24: Brush stroke effect with engobe

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Overview

This chapter exhibits and discusses the results of the study. It analyses the results of the ceramic facial slices with Ghanaian traditional symbols created in addition to art techniques based on their formal and conceptual qualities where it addresses and portray Ghanaian culture with their aesthetic and philosophical significance. The study exploited mainly unrealistic design concepts with some of the works having specific names with meanings that reflect Ghanaian cultural edifies or social and cultural values. The chapter therefore analyses selected works that possess the above significance.

4.1 Physical Test on Prepared Bodies with their Percentage Shrinkages

Table 4.1: Percentage linear shrinkages of body A (5%Manganese+90%Mfensi clay)

Sample	Plastic length (cm)	Dry length (cm)	Fired length 1000°C(cm)	Fired length 1150°C(cm)	Drying shrinkage %	Firing shrinkage 1000°C (%)	Firing shrinkage 1150°C (%)
A1	5.0	4.9	4.8	4.7	2	2.0	4.1
A2	5.0	4.8	4.7	4.7	4	2.1	4.2
A3	5.0	4.8	4.7	4.65	4	2.0	3.3
A4	5.0	4.8	4.7	4.65	4	2.0	3.3
A5	5.0	4.8	4.7	4.65	4	2.0	3.3
A6	5.0	4.8	4.7	4.65	4	2.0	3.3
Total					22	12.1	21.5
Average shrinkage					3.7	2.0	3.6

Table 4.2: Percentage linear shrinkages of body B (10%Manganese+90%Mfensi clay)

Sample	Wet length (cm)	Dry length (cm)	Fired length 1000°C(cm)	Fired length 1150°C(cm)	Drying shrinkage %	Firing shrinkage 1000°C (%)	Firing shrinkage 1150°C (%)
B1	5.0	4.9	4.8	4.75	2.0	2.0	3.1
B2	5.0	4.9	4.8	4.75	2.0	2.0	3.1
B3	5.0	4.8	4.7	4.7	4.0	2.1	2.1
B4	5.0	4.8	4.7	4.65	4.0	2.1	3.1
B5	5.0	4.8	4.7	4.65	4.0	2.1	3.1
B6	5.0	4.8	4.7	4.7	4.0	2.1	2.1
Total					20	12.4	16.6
Average shrinkage					3.3	2.1	2.8

Table 4.3: Percentage linear shrinkages of body C (15%Manganese+85%Mfensi clay)

Sample	Plastic length (cm)	Dry length (cm)	Fired length 1000°C (cm)	Fired length 1150°C (cm)	Drying shrinkage %	Firing shrinkage 1000°C (%)	Firing shrinkage 1150°C (%)
C1	5.0	4.8	4.7	4.7	4.0	2.1	2.1
C2	5.0	4.9	4.85	4.8	2.0	1.0	2.0
C3	5.0	4.8	4.7	4.7	4.0	2.1	2.1
C4	5.0	4.9	4.75	4.7	2.0	3.1	4.1
C5	5.0	4.8	4.75	4.7	4.0	1.0	2.1
C6	5.0	4.9	4.85	4.8	2.0	1.0	2.0
Total					18	10.3	14.4
Average shrinkage					3.0	1.7	2.4

Table 4.4: Percentage linear shrinkages of body D (20%Manganese+80%Mfensi clay)

Sample	Plastic length (cm)	Dry length (cm)	Fired length 1000°C (cm)	Fired length 1150°C (cm)	Drying shrinkage %	Firing shrinkage 1000°C (%)	Firing shrinkage 1150°C (%)
D1	5.0	4.8	4.75	4.7	4	1.0	2.1
D2	5.0	4.8	4.75	4.7	4	1.0	2.1
D3	5.0	4.9	4.8	4.75	2	2.0	3.1
D4	5.0	4.9	4.85	4.8	2	1.0	2.0
D5	5.0	4.9	4.85	4.8	2	1.0	2.0
D6	5.0	4.9	4.8	4.75	2	2.0	3.1
Total					16	8.0	14.4
Average shrinkage					2.7	1.3	2.4

Table 4.5: Percentage linear shrinkages of body E(25%Manganese +75%Mfensi clay)

Sample	Plastic length (cm)	Dry length (cm)	Fired length 1000°C (cm)	Fired length 1150°C (cm)	Drying shrinkage %	Firing shrinkage 1000°C (%)	Firing shrinkage 1150°C (%)
E1	5.0	4.9	4.85	4.8	2	1.0	2.0
E2	5.0	4.9	4.85	4.8	2	1.0	2.0
E3	5.0	4.8	4.75	4.75	4	1.0	1.0
E4	5.0	4.9	4.85	4.8	2	1.0	2.0
E5	5.0	4.9	4.85	4.8	2	1.0	2.0
E6	5.0	4.9	4.85	4.8	2	1.0	2.0
Total					14	6	11.0
Average shrinkage					2.3	1.0	1.8

4.2 Test on Percentage Absorption on the various Bodies

Table 4.6: Percentage water absorption of body A (5%Manganese+95%Mfensi clay)

Sample	Dry weight (g)	Soaked weight (g)	Water absorption (%)
A1	57.8	62.8	8.7
A2	57.9	62.8	8.5
A3	57.2	61.3	7.2
A 4	59.4	64.6	8.8
A5	58.6	64.2	10
A6	59.1	65.0	10

Average water absorption of body A is 8.9

Table 4.7: Percentage water absorption of body B(25%Manganese+75%Mfensi clay)

Sample	Dry weight (g)	Soaked weight (g)	Water absorption (%)
B1	62.4	68.0	9.0
B 2	62.6	67.5	7.8
B 3	60.8	66.0	8.6
B 4	64.0	69.5	8.6
B 5	64.3	69.8	8.6
B 6	64.2	69.8	8.7

Average water absorption of body B is 8.6%

Table 4.8: Percentage water absorption of body C(15% Manganese + 85% Mfensi clay)

Sample	Dry weight (g)	Soaked weight (g)	Water absorption (%)
C1	54.1	58.1	7.4
C2	55.4	60.5	9.2
C3	54.6	59.6	9.1
C4	54.0	58.4	8.1
C5	58.4	63.1	8.0
C6	54.9	59.0	7.5

Average water absorption of body C is 8.2%

Table 4.9: Percentage water absorption of body E(25%Manganese+75%Mfensi clay)

Sample	Dry weight (g)	Soaked weight (g)	Water absorption (%)
D1	68.2	73.6	7.0
D2	65.6	70.4	7.3
D3	62.4	68.4	9.6
D4	66.5	71.5	7.5
D5	64.2	70.0	9.0
D6	63.7	68.8	8.0

Average water absorption of body D is 8.1%

Table 4.10: Percentage water absorption of body E

Sample	Dry weight (g)	Soaked weight (g)	Water absorption (%)
E 1	57.2	61.1	6.8
E 2	56.1	60.1	7.1
E3	60.0	64.6	7.7
E 4	57.9	62.0	7.1
E 5	54.6	59.4	8.8
E6	57.9	63.8	10

Average water absorption of body E is 7.9%

Table 4.11: Summary and comparison of the various body samples on their percentage shrinkage and water absorption.

TEST	BODY A	BODY B	BODY C	BODY D	BODY E
Percentage Dry Shrinkage	3.7	3.3	3.0	2.7	2.3
Percentage Fired Shrinkage At 1000	2.0	2.1	1.7	1.3	1.0
Percentage Fired Shrinkage At 1150	3.6	2.8	2.4	2.4	1.8
Percentage Water Absorption At 1150	8.9	8.6	8.2	8.1	7.9




In the making of facial slice both exterior and interior, some factors are considered in choosing a body. The body should have a low shrinkage and a low porosity or water absorption. For only interior any of the Bodies could be used. From the summary table, comparing the percentage dry shrinkage of the various bodies, Body E(25% Manganese+75% Mfensi Clay) has the lowest shrinkage of 2.3% and Body A (5% manganese +95% Mfensi clay) has the highest of 3.7%. Comparing the fired shrinkage at a temperature of 1000 of the various bodies prepared, Body E had the lower of 1.0 percentage and Body A has the higher of 2.0%. In the final firing shrinkages, Body A had the highest of 3.6% and Body E having the lower of 1.8%. With water absorption, Body E had the lowest of 7.9%.

From the table, it could be deduced that the more the manganese the less the shrinkage. There is because manganese is preventing the clay body from shrinking both in the drying state and in the firing state. With Manganese in clay body, during firing vitrifies, and fuses with the clay material. This makes the material less porous. From the table the body with much manganese fused with the material clay, the reason for the low rate of water absorption.

For the production of slices for the building industry, most buildings are finished on the outside. The expectation is that, a body with a low dry rate and a lowest shrinkage would be good. Another factor is that, a body with a low absorption rate is considered, since the facial slices would be outside. The slices used outside should also have the lowest rate of absorbing water. This would enable the slice to protect the inner materials of the buildings. In this vein, Body E was chosen for the production of the facial slice since it has all these qualities; 2.3% dry shrinkage, 1.8% fired shrinkage and 7.9% water absorption as compared with the rest of the bodies.

Technically, here in Ghana, there are no standards for such works. A personal communication with the Head of materials section at BRRI, confirms this. He further explained that, outside the country, “the rate of shrinkage and water absorption should be between zero to ten percent (0-10%),” “Technically with the Ghanaian weather water absorption should be between zero to nineteen percent (0-19%). From Table 4.11, all the five bodies are suitable for facial slices and with manganese in the body makes it have a good strength.

Below are the various colours obtained from the Body samples composed with names given by the researcher.

No.	Colour of Samples	Name of Colour
Body A 1		Brown
Body B 2		Dark
Body C 3		coffee Dark



Body D 4		Light Brown
Body E 5		Spotty dark

Plate 4.1: Colour Results of Mfensi clay body

4.3 Philosophical discussion on incision work



**Plate 4.2: *Obira rehwe wo* (All eyes on you)
Size: 25 inch by 29.5 inch)**

The theme *Obira rehwe wo* (All eyes on you) has been designed to throw caution to everyone that in the daily routines of life, one is being watched. We cannot run from the fact that, indiscipline and bad virtues have become a common phenomenon in our society. In this vein, *Obira rehwe wo* always imbue into the individual that whatever he does whether in public or in secret places, it is in the light of someone's countenance. Apart from the philosophical underpinnings of the design *Obira rehwe wo*, it has been artistically produced such that the designs depict five eyes inherent in the designs which could not be easily seen. This is to reiterate the point that, although

one may think that he is not been watched, there is an unseen eye observing all your activities.

During the preparation of the body an amount of manganese was added to the clay to fuse well with the clay and for standard strength, given an out look that will be appealing. After firing the results wanted is what was got which when used in the building industry will be of good quality, the aim of this production would be achieved. The preparation of the body and the firing temperature was made to withstand the weather condition in Ghana.

The uses of ceramic facial slices are not common in Africa and for that matter Ghana but the materials are common and easy to come by. It is normally made of natural material (clay) with some additives (manganese) to make it more rich and beautiful. It is a work created to be used on both exterior interior decorations on walls.

4.4 Philosophical Discussion on Sprinkling

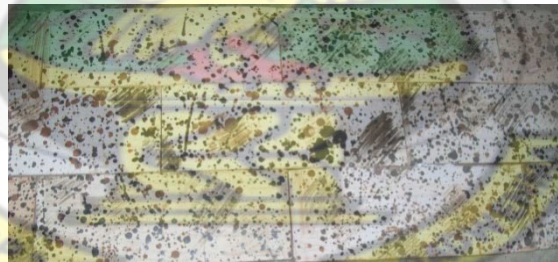


Plate 4.3: *Asisa* (Hetty 2009)
Size: 22.5inches×29.5inches

The design on slices depicts an adage, “how man will become is not known by anybody except God”. God has given all individuals various gifts to explore for our destiny. Although we all live in one big world and surrounded by vast resources, yet not all of us were born with a silver spoon in our mouth neither all have had things on a silver platter. Looking at the designs on the facial slices some of the dots are in isolation others have gathered at one place. This means that, God has hidden so many

things on this earth and it is left to each individual to plan well to be able to find the hidden treasure or wealth. The deepened spots signify those who are able to explore their entrepreneurial skills to achieve success in life. As stated in the Bible, Matt 7:7 – 8 that states “Ask, and it shall be given you, seek, and you shall find, knock, and it shall be opened unto you. For every one that ask receives and he that seek finds, and to him that knocks it shall be opened. In this light, the spots with deeper engobes are those who apply what is written in Matthew 7:7-8 to succeed in life. Philosophically and culturally significance is that hard work precedes success.

Again as said about work I, in the building industry ceramic facial slices with decorations. This texture given to it makes it local and artistic. It can be used to finish out-ward surfaces of buildings in the building industry.

4.5 Philosophical discussion on Marbling Art



Plate 4.4: Blending of colours (glory of creation)

Abodzi enimoyam (Hetty 2009)

Size 29 by 23 cm

This design has been artistically executed on the facial slide using the marbling technique. The idea was to unearth the possibility of creating designs on ceramic works using engobe application of marbling technique. The work results shown in the

above is marbling techniques for its creation. The background of the work shows a colourful meandering marbling design produced by just blowing the engobes on the work to achieve harmonious and contrasting colours. These colours blend accidentally to create more variety colours because of marbling process. The philosophy behind this work is such true to all who believe. *Abodzi enimoyam* that means glory of creation. Man does not know the beginning of creation but biblically it understood that the earth was without form that is in a haphazard way before the Lord commanded light, made the earth and sea. In this design, it is believed that no matter how difficult life is, there is surely light at the end of the tunnel.

4.6 Philosophical Discussion on Texturing (Creative Art)



**Plate 4.5: *Eyin ye few* (The beauty of old age)
(Hetty 2009) Size 22.5×29.5inch**

The prime motivation of this design stems from the fact that in our society, people do not want to accept wrinkles during old age. For this reason, some appear to look for remedies to curtail their wrinkles. The design is laying bare a fact that being old is not an end to looking attractive and that one can inextricably be beautiful even in his deepest old age if only one takes a good care of the body. The careful arrangement of the slices coupled with the execution of the design on the surface seems to connote if

one is able to take good care of him/herself, there is no doubt that he would be able to maintain a considerable amount of his/her beauty. Old age in life is inevitable so when that change happens one must accept it and make a beauty out of it. Growth is so beautiful that when been well managed will become admirable.

In the world of art, there is nothing waste or not important. Every good artist should be able to use anything he/she lay hands on and comes out with an artistic creation. Here, the researcher observed that most trees have designs that could be used as a resource for designing ceramic facial slices as an artistic facing finish to the building industry to exhibit natural designs on plants.

4.7 Philosophical discussion on Stone Texturing



**Plate 4.6: *Banbɔ* (protection) Hetty 2007
(Hetty 2009) Size 22.5×29.5inch**

This is a textured design derived from the bark of the tree. *Banbɔ* which literally means protection is something every living thing require. The researcher observed the bark of trees have some designs that could be generated as a medium of design ceramic facial slices. Philosophically, the researcher is laying bare a fact that although one could have all the necessities of life, protection or security is the key word. Because it is

through security or protect in life that one could survive, which would also lead to continuity of the family heritage and then balance in the society.

4.8 Philosophical Discussion on Multicolour Painting



**Plate 4.7: *Wiadzi feefeew* (beautiful world)
Size 22.5inch×29.5inch**

Wiadzi feefeew literally means beautiful world. The philosophical basis for this design is that it takes the conglomeration of different colours to achieve a beautiful picture as evidently seen on the plate above. The design furthermore reiterate the point that whether black or white in complexion does not really matter, but to achieve a beautiful and a desirable results, one may have to work conscientiously or go beyond the barrier of race. Again, the conglomeration of the different colour schemes distributes visual illusions, which is aesthetically pleasing and stimulates movements of the eye. This means that when a ceramic facial slice is produced and the above design is made on the surface, the facial slice would not only serve as a facial finish but would be aesthetically pleasing to the viewers.

4.9 Philosophical discussion on Embossing



Plate 4.8: *Kroyε* (Hetty 2007)
Size 22.5inch×29.5inch

This is an *adinkra* symbol developed from Agama a symbols by Adolph Agbo 2006 – “*Domedzadzrado*” an Ewe symbol which means reconciliation. The researcher decided to modify the original symbol but the same meaning and other explanations attached to the meaning have been retained. Looking at the modified version the two curved shapes are symbols of hands and the two ovals with some projections are heads that signifies two factions embracing each other. The moral value behind the original “agama” symbol two heads are better than one, which teaches the society to be able to settle their differences through mutual compromise and reciprocal understanding

Change should be seen as one of a natural phenomenon that occurs to one as he or she grows. There is an adage that “the old order changeth yielding place to new. This phenomenon happens in all living things. The philosophical basis for the design stem from the fact that many people in our society do not want to accept change whether be it an economic change, political change and even physiological change.

4.10 Philosophical Discussion on Sgraffito



Plate 4.9: *Nsisanyε* (Changes) (Hetty 2009)
Size 22.5inch×29.5inch

Man is therefore troubled and looking out for remedy to avoid physiological change but should be seen as a natural phenomena. The design also throws light on the fact that man must work very hard during his youth to secure a better old age.

The design was taken from the claws of an eagle bird. The designs have been executed such that there are changes in the various phases of the designs. A careful look at the slice would reveal that some of the designs have been elongated, whilst others have faded designs all to depict the various changes of life.

4.11 Philosophical Discussion on Stamping



Plate 4.10: *Anieden* (Hetty 2009)
Size 22inch×29.5inch

This work as stated above is a stamped work with a manganese finish in the design to bring the work out. This work depicts the character of the researcher's very strong person a never give up spirit and no matter the stiff conditions, she is able to adapt herself to it but with keen eyes. This work depicts the researcher's tenacious character. The design was developed from Akan tradition symbol *dwenini mmen* that is literally the horn of a ram. The ram uses the horn to fight but with carefulness, it is able to defend itself and move ahead. No matter how difficult his opponent may be it will fight until it succeeds and that is the character of the researcher. This is to point to the fact that one should not abandon a course midstream but with a bit of advantage in hand, should strive hard until victory is won. The work is lightly finished with a white engobe and light brushes of Manganese. This work could be used for both interior and exterior of buildings.

4.12 Philosophical Discussion on Brush Strokes



Plate 4.11: *Nhomawom'faso* (Hetty 2007)

The importance of skin is something interesting and fascinating. The skin of animals is used in the production of bags, shoes, upholstery, just to mention a few. More importantly, the fur serves as a shield or protection of the body. The philosophical basis of the design is to reiterate the fact that just as the fur is very useful in the production of many products, humans likewise can be useful in every venture.

4.13 Slices Rendered On Some Buildings



Plate 4.12: *Anieden* slices on a building



Plate 4.13: *Kroyeslices* in rendition on a building



Plate 4.14: *Kroyε* slices in rendition on pillars of a building



Plate 4.15: *Wiadzi feefeew* slices in rendition on a building.



Plate 4.16: *Abodzienimoyam* slices in rendition on a building

4.14 Cost Analysis

1BAR (30lb).....	GH¢ 1.5p
5bars (150lb).....	GH¢ 7.5p
Engobes (3).....	GH¢ 3.0p
5kg manganese.....	GH¢ 32.0
Firing.....	GH¢ 10.0
Polyethene.....	GH¢ 0.30p
Labor.....	GH¢ 10
Total	GH¢ 62.80p

1 bar produces-----20pieces

5bars produces...100pieces

If 100pieces cost for producing GH¢ 62.80

$$\begin{aligned} \text{1 piece will cost} & \dots\dots\dots 1 \div 100 \times 62.80 \\ & = 0.628 \end{aligned}$$

Each will cost.....= 0.65p or 0.70p

On market 1 box of slices (24 pieces).....GH¢ 20

$$1 \text{ piece} \dots\dots\dots 1 \div 24 \times 20 = 0.83p$$

1 square meter will cost GH¢ 40 for the one on market but for the new ones produced will cost GH¢ 31.2 or GH¢ 32.0 if the price will be 0.65p and GH¢ 34.0 if 1 piece is priced at 0.70p depending on conditions available. Comparing the market price to the new ones yet to be on market, the newly produced decorated facial slices for the building industry would be.



CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.0 Conclusion

The study has laid bare the fact that slices can be produced using locally available materials such as Mfensi clay and manganese. The study also revealed that the slices found on the open Ghanaian market which are usually plain, can be decorated to enhance its aesthetic look. The study had three objectives namely: to identify local ceramic raw materials suitable for the production of facial slices; to generate designs from traditional motifs to give an aesthetic look; and to produce facial slices using the identified local raw materials. Materials identified for the project were examined, bodies prepared out of them, and tested to ascertain their suitability in terms of shrinkage and water absorption. These test helped the researcher to know the additives that would help prevent warpage and porosity. To check warpage and porosity of the material (clay), manganese as an additive was added.

In addition to this, the work was covered with a large polythene sheet to avoid warping. Engobes were applied before bisque (1000) firing and manganese were also applied on some after first firing/bisque to a second firing of 1150 enhance the beauty. From the experiment, the more the manganese, less the shrinkage the darker and harder the facial slice becomes when fired. Modification of traditional symbols created interesting designs. Facial slices finished with oxides are beautiful and very appealing to the eyes. The use of the slab method was slow and tedious for mass production.

The first objective of the study was achieved by using geotechnical methods to acquire the physical properties of the Mfensi clay used. The clay collected from Mfensi was processed to determine the fired strength, porosity and shrinkage level to

ascertain its suitability for the production of slices. The results were recorded and tabulated, and these clearly showed that the bodies were very suitable for the slices.

The second objective of the study was to generate designs from traditional motifs (Adinkra symbols). This was achieved by manipulating motifs using the Photoshop application programme. The designs generated were not only geared towards aesthetics but also projecting the rich cultural heritage of Ghana.

The findings of the study clearly revealed that it is practically possible to produce facial slices with the locally available materials, which can also withstand the atmospheric conditions of the country. Mfensi clay, the chief material, together with its required additive (manganese) can produce very healthy facial slices, which has the properties of any standard. The principal conclusion of the study is that locally available materials are equally better in the production of facial slices and that decorating it with traditional motifs could enhance the aesthetic of the slices and promote cultural growth.

5.1 Recommendations

It is highly recommended that the efforts of teaching the production of tiles and facial slices should be redoubled to revive the enthusiasm in the production of these products. It could be evidently clear that these products play an indispensable role in our building industry. Thus, the researcher recommends that the production of slices should be treated as a main subject for two semesters

It is again recommended that ceramist and artists in general should explore the environments and look for natural objects to develop designs from. Again, traditional symbols could as well be developed into interesting designs with the aid of the computer to enhance finishing techniques in products.

In order to foster creative development in Ghana, the researcher recommends that different materials and other minerals should be exploited to bring out variety in the production of facial slices. Also, Vocational institutions especially technical institutions as well as NGO`s should adopt the method to train and give employable skills to people to make it popular.

Finally, the researcher would liaise with Department of Industrial Art to publish the findings of the study to promote the knowledge of facial slices.



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