Assessing the Potency of Egyptian Paste Technique as a Viable Alternative in Glazed Beads Production

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ABSTRACT

The process of ceramics making involves the material knowledge, design fabrication and application of heat, this processes makes ceramics making quite challenging. The Nigerian ceramics industry suffers a lot of set back due to the epileptic power supply, poor alternative energy source, insufficient support from the government to the industry and high dependence on imported materials and so on. The aforementioned limitation faced by the industry results in high cost of production which grossly limit productivity in the local ceramic field. The research examined the potency of Egyptian Paste technique as a viable method for glazed beads production. The Egyptian Paste technique adapted in the project enables the beads to be glazed in a single firing. In making glazed beads, two firing phases(I.e bisque firing and glaze firing) is required. The Egyptian paste technique allows the two firing phases required for glaze application in ceramics making to be merged into one. This technique skips the bisque firing phase by introducing glaze into the clay-mix at the wet stage (i.e. mixes the glaze with the clay) so the beads were fired to completion at once.

Keywords: glazed beads, Egyptian paste technique, kiln, ceramics, firing.

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1. INTRODUCTION

Early evidence of man's development of art indicates that beaded decorations have formed parts of body adornment aimed at serving different functions. Some of these functions could be ritual purposes, decorations, medicinal purposes to mention a few. Africans wear beads to communicate cultural values in a symbolic language to express rank, religion, politics and artistic attitude. These beads are made of various materials like shells, stone, clay, metal and glass. A bead is a small, decorative object that is usually pierced for threading or stringing.Beads are frequently used in jewelry. These beads may be made of glass, gemstones, metal, wood, shells, clay and polymer clay. The oldest surviving synthetic materials used for bead making have generally been ceramics; pottery and glass. Clay was used to make beads, this is common among bead-makers of the Baule people in Cote d'Ivoire who modeled and fired clay to create exquisite terracotta beads. Clay and colored earths were perhaps the earliest expressive or "artistic" media used by humans, and as such they may have been employed for a variety of other needs [balls for slings, lining basketry, counting tokens, beads or ornaments, and so forth] (Schmandt-Besserat, 1974, 1977a, b, 1978). From prehistoric storage jars to tiles on the space shuttles, pottery and ceramics have played a key role in innumerable human endeavours.

1.2 Contemprorary Trend

Pottery is an art native to Africa. Pottery traditions in Nigeria are found in Umuahia, Abuja, Bida, Doko, Kano, Ilorin, Afikpo, Cross River to mention a few (Chukueggu, 1998). The modern Nigerian ceramic tradition is therefore a modified continuum of the original traditional pottery culture (Chukueggu, 1998). Agberia (1998) informs, although there were over twenty two ceramics and allied product companies wel spread through the country. Currently, these companies have seized to exist (Guardian, 1992:back page). As a result, ceramics products available in the Nigerian market, are solely imported from Europe and the Indo-Asian world, this is as a result of seizure in the existence of the Nigerian ceramic companies.Agberia (1998), Chukueggu (1998), Oaikhinan (2017) informs on how ceramics companies established in Nigeria ceased to exist and what led to their extinction.

1.3 Limitations of the Nigerian Ceramics Companies

The extinction of these company were as a result of high cost of equipment, alternate fuel and materials. The ceramics product made were therefore expensive especially when they are compared with the imported ones. These companies began to experience low sales until they were closed up. The way forward out of this difficulty is to develop indigenous technology that is able to maximally utilize the available resources to produce ceramics efficiently. The present challenge necessitate the need to build on our current know-how and expertise in other to adapt this technological trend to the Nigerian environment. In line with this, this research seeks to recommends using Egyptian paste technique as a viable alternative in glazed beads production (Akande-Adedeji, 2018).

1.4 Research Problem

There exist quite a number of scholarly works on beads in Africa generally, of such are the works of Frobenius (1968), Negri (1976), Fagg (1980), Euba (1982), Geary (1983), Dublin (1987), Davies (1991), Harter (1992), Adepegba (1995), Aremu (1990), Davison (1972), Willet (1997), Stokes (1998), Chukueggu (1998), Drewal & Mason (1998), Blier (1998), Akintade Oyetade (2004), and James W. L, O. Akin I & ThiloRehren (2006), to mention a few. Of the vast literature on beads in Africa, there is limited document on glazed beads. Also, Researcher such as Fatunsi (1989), Ahuwan (2003), Ada (2005), Daburi (2007) Agberia (1996), Fowowe M.O (2004), Igwilo B.M. (1983), Ewule, E.E (2003), Okunade, M. A. (2003), Umoru-Oke (2012) to mention a few, have written extensively on pottery in Nigeria, none have dealt on the subject glazed beads production. Although a number of researches have been conducted on pottery by scholars in Nigeria as mentioned above, there is no record of anyone having focused on the production of glazed beads.

The scholars explored pottery vessels, its technique, existing forming methods and functions of these wares, there is no record of glazed beads existing. Also, among the practicing potters, there's diminutive exploration in glazed beads making. The lack of practical exploration in glazed bead making is due to the high cost of production coupled with the rigorous process entailed in glazed beads making. Ayoola Ibukun, the CP.A.N.(Craft Potters Association of Nigeria) coordinator South West opines that the delicate process of glazing bead and the fuel consumed in firing the beads discourage its production (personal communication, 2012). Oaikhinan (2017) notes, although Nigeria has enough raw materials for ceramics production across the six geo-political zones, but over $800 million is being spent annually on the importation of allied products, while the country misses out in the projected $408 billion global market, and over three million new jobs yearly. Also, less than three per cent of Nigerians would like to set-up ceramics small businesses because of unfriendly market environment for local products, compared to 51 per cent of people in the U.S. and China (Guardian Newspaper,1992).

The project therefore, provided veritable first-hand information on implicit mode of ceramic bead making using Egyptian paste technique. It provides a documentation of the innovative forms, styles, technique and decorative element of glazed beads. The fact that various studies carried out on ceramic processes has not dealt expansively on

the production of glazed beads justifies the present study.
Using Egyptian paste technique in glazed beads production proffer a better understanding of factors that can promote the viability of glazed beads. The aim of this research is to use Egyptian paste technique to produce glazed beads with a view to providing a more cost effective process of bead production. The specific Objectives are to identify materials used in the technique; determine the appropriateness of the available local materials to use; adapt the Egyptian Paste technique into bead-making, and produce beads of different designs for necklaces and bracelets. The project also explores ways of utilizing locally sought material in place of the imported ceramic materials.

2. METHODOLOGY

Experiments was conducted to determine the most suitable of the local material that can be used in the Egyptian paste technique. In formulating Egyptian paste, the clay content was kept low to allow for sufficient glass-forming material to be present and to give an open porous structure which will permit the migration of soluble ingredient to the surface. Composition of the original Egyptian paste which is turquoise ceramic is reputed to be 90% quartz with some soda. The glaze has been given as 75% silica, 20% Alkali and calcium, 1.6% copper oxide by analysis (Robert, F: 1979). An approximation in modern materials may be made as paste or body. The research required a full studio-work in processing the materials. The following materials ; Ball clay, Silica sand, Soda Ash, Kaolin, Granite sand, Copper oxide, Iron oxide, cobalt carbonate, Nickel wire was important for the success of the research. Adequate photographic documentation was ensued.

The study involved testing of material composition that might be suitable for the Egyptian paste. Different samples of the paste in varying proportion was tested to determine the most appropriate composition. The most suitable of these samples was recommended for this project, see plate 1. Egyptian paste recipes generally contain about 60% of the body was non-plastic material; there was at least 10% of a sodium-bearing material such as soda ash, bicarbonate of soda, or borax; and 20% clay. The paste is non-plastic, stiff and sticky when water was added (Plate: 4-5). Although hand building techniques can be used, Egyptian paste works best when formed or carved into simple shapes hence rubber moulds were made.

Plate 1: test piece to determine the material in proportion. @Akande Olufunke (2014).

The molded pieces were left untouched to protect the glaze materials which rose to the surface and makes the un-fired bead fragile, almost furry-looking, coating. The slower a piece dries, the longer the sodium has to get to the surface. Therefore, slow drying helps achieve the best glaze coating possible. In formulating Egyptian paste, the clay content is kept low to allow for sufficient glass-forming material to be present. this give an open porous structure that permits the migration of soluble ingredient to the surface. The steps were broken down into four stages which is listed as follows;

2.1 Approach To Research

2.1.1 Stage 1

Step i: Determining the materials needed

Composition of the original Egyptian paste recipe as Robert suggested, which is turquoise ceramic reputed to be 90% quartz with some soda. The glaze has been given as 75% silica, 20% Alkali and calcium, 1.6% copper oxide (Robert, 1979). The material needed for the paste-mix was identified and the following percentage was used;

70-80% non-plastic material (Flint)
15-25% of Soda
5-10% of plastic material (ball clay)
5-10% of pigment oxide is used for coloring (cobalt oxide, Iron oxide, chromium oxide).

Step ii

The researcher identified the required equipment for the project. This equipment is listed as follows;

a) Stilt: a stilt is like a hanger which suspends each bead from coming in contact with other surface before and during firing. This is to avoid rubbing off of the surface salt and “kissing” when the glaze is melting.
b) Test kiln: for a project like this a test kiln is needed in order to reveal gross error in glaze mix before a full pack is spoiled. Test kiln fire and cool more rapidly than a production kiln.
c) Measuring scale: the scale is important in avoiding error, since different materials are used and therefore needed to be weighed or measured in identified proportion.
d) Metallic wire: A metallurgist was consulted to determine what available metal can be with-stand a temperature of 11000C without distorting. Copper (from peeling a 2.5 electrical wire) and nickel wire (tungsten) were selected because they are easily acquired and suitable for the experiment. Copper wire was mostly used since the nickel wire was found to be too thin and could not be easily detached after firing.

2.1.2 Stage 2

Step i: The researcher sourced for the identified material and designs stilt required for the project:

Stage iii

Step i: making of the beads.

The glazed beads were made using the following procedure;

a. Prepare a 115 grams (g) batch of dry Egyptian paste. The dry powder was divided into four samples. Each batch contains a different metal oxide as colorant. The following materials were weighed out and mixed thoroughly in a plastic cup.

Flint 85 grams (g) provided silica (SiO_2), alumina (Al_2O_3),

Ball clay 10 grams (g) provided silica, alumina and plasticity
Soda ash 15 grams (g) sodium carbonate (Na_2CO_3), a flux, (i.e. it helps the glaze melt) thereby lowering the melting temperature.
b. Measure out the ingredient into a plastic bag.

c. Use a plastic spoon to thoroughly mix the dry materials.

d. Divide the dry powder equally among four plastic cups.

e. Add one of the following colorants to each cup. Weigh carefully, colorants are powerful fluxes, a little quantity of colorant is added so the bead do not end up a puddle on the kiln shelf. A record of the quantities of each material used was noted.
Chromium oxide (CrO)
Black iron oxide
Cobalt carbonate ($CoCO_3$), 0.04 - 0.1 grams (g)
Red iron oxide (Fe_2O_3), 0.5 - 1.0 grams (g)

f. Water was added slowly and thoroughly mixed to a clay consistency (it had to be done slowly because it is easy to add too much water).

g. The resulting clay was wet (too much water) so it was allowed to set a bit on the work table and then work it around with to get it dry enough to shape but not so dry it would crack.
h. Form the paste into at least four beads or other small objects. A broom was used to pierce holes for beads. String the pierced beads on a copper wire.

i. The strung beads were covered with nylon until it is set for firing.

j. Thorough washing of hand was ensured before and after the preparation of the beads.

It was important to handle the beads as little as possible until the beads were transported to the kiln and fired to approximately 950ºC to avoid rubbing-off of the salt visible on the surface of the beads. At 950ºC, the beads were glowing, reflecting the color derived from the colorant. The procedure is seen in plate 2-6.

Plate 2: Dry-mixing of different component materials © Akande Olufunke(2014)

Plate 3: Dry mixture of the flint, soda ash, ball clay and chromium © Akande Olufunke(2014).

Plate 4: wet mixture of chromium, flint, soda ash and ball clay © AkandeOlufunke (2014).

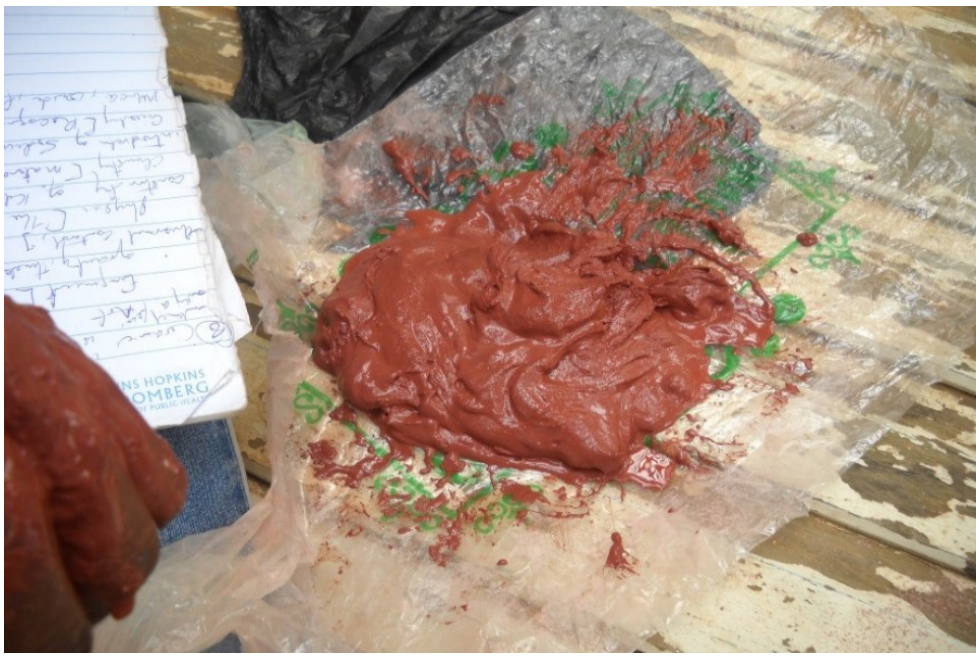

Plate 5:Wet mixture of Iron oxide, flint, © AkandeOlufunke (2014).

Plate 6: molded beads in different shapes @Akande Olufunke (2014)

Plate 7; blue glazed beads (matt finish) arranged on nickel wire.

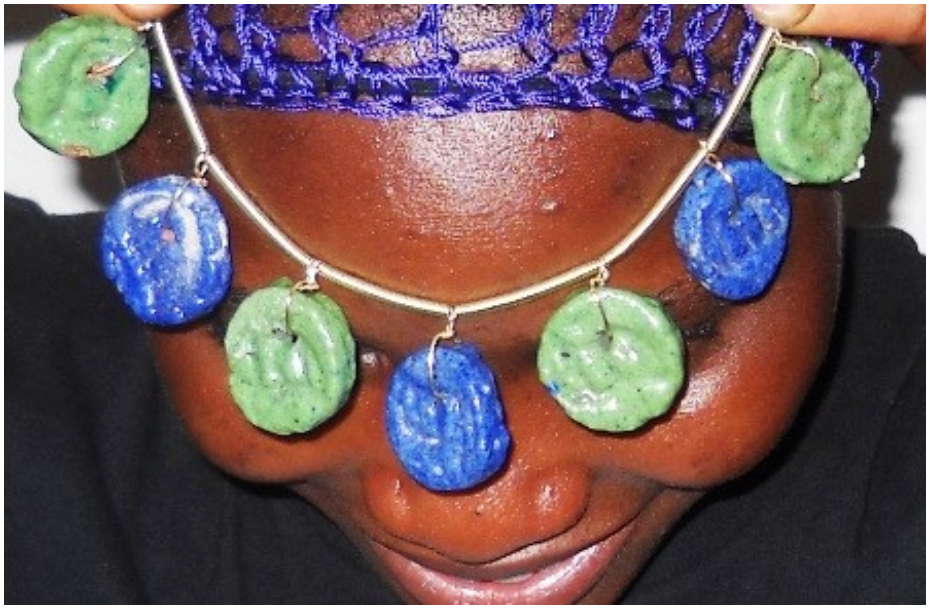

Plate 8: green/blue jewelry worn by a model
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3. RESEARCH FINDINGS

The research has been able to establish a more viable mode of glaze beads production which can be adapted commercially for use.

These are further highlighted thus:

- the production cycle have been compressed into half the usual time spent in making
- glazed beads.
- less energy (fuel) is consumed in firing the kiln when this technique is used.
- the effort and time required for kiln loading and offloading is cut in half, while a ceramic artist can still produce the same amount of finished work.
- The creative idea conjured while making glazed beads is not lost due to the time lapse in between production (i.e. waiting for the piece to dry and then be bisque fired) when working with Egyptian paste.

3.1 Problems Encountered

During the course of this project, the problems encountered are highlighted as follows:

a) Locating the relevant material(flint and oxides) proved difficult since there is no ready market to procure the necessary material like flint and so on. The Bar-beach sand was milled and used as flint.
b) Modeling the beads proved difficult since materials like flint and soda-ash are non-plastic and do not retain design form.
c) Modeling of the beads shape was time consuming.
d) After modeling the beads, it was difficult to retain the shape intact considering the efflorescence nature of the paste which tends to crack ad flake-off. The mould was therefore close to the firing time see figure 9.

Plate 18: Partly Flaked Beads.
© AkandeOlufunke (2014).

Some of the beads flaked-off as a result of the efflorescence nature of the salt (soda ash) contained in the mixture. Also finding a suitable wire to hold the beads during firing posed a problem, a metal that is able to withstand heat to a temperature of above 9500C was required for the exercise since the glazed beads do not mature at a temperature below 9500C. Nickel wire was initially used but was discovered to be inadequate because it get embedded in the bead. A copper wire was later used for this purpose.

4. CONCLUSION AND RECOMMENDATION

4.1 Conclusion

Oaikhinan (2017) notes, although Nigeria has enough raw materials for ceramics production across the six geo-political zones, but over $800 million is being spent annualy on the importation of allied products, while the country misses out in the projected $408 billion global market, and over three million new jobs yearly. Also, less than three per cent of Nigerians would like to set-up ceramics small businesses because of unfriendly market environment for local products, compared to 51 per cent of people in the U.S. and China. As a result of these, ceramics products available in the Nigerian market,are solely imported from Europe and the Indo-Asian world.

4.2 Recommendation

The modern Nigerian ceramic tradition which is a modified continuum of the original traditional pottery culture which is an example of numerous artistic traditions of our past should be modified for economic reasons. The development of the local raw material content will create employment and stimulate the production of intermediate raw materials, in the mineral sectors to meet the need of the industries.

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