Production of Engobe for Ceramic Decoration.

ABSTRACT

Ceramic decoration has a rich history dating back millennia, evolving from rudimentary patterns to intricate designs, thereby enhancing the aesthetic appeal of ceramic artifacts. Engobe, a versatile ceramic coating material, plays a pivotal role in this evolution. This research aims to provide a detailed investigation into the production of engobe for ceramic decoration, encompassing a thorough examination of raw materials, formulation methodologies, and application techniques, with the ultimate goal of advancing the craft of ceramic decoration. The research commences with an extensive exploration of raw materials commonly used in engobe production namely Kaolin, Feldspar, Recycled glass, Zircon and stain/oxides pigments are analyzed for their chemical compositions, mineralogical properties, and suitability for engobe formulation. The formulation of engobe is a complex process that demands meticulous consideration of factors such as rheology, color stability, adhesion, and firing temperature compatibility. Furthermore, the research evaluates various application techniques for engobe deposition, including brushing and dipping. The impact of application methods on engobe thickness, uniformity, and texture is scrutinized, facilitating the selection of the most suitable technique for specific ceramic projects. The engobe-coated ceramics are subjected to firing processes at 1100 ^{o}C temperatures, ensuring that the engobe remains stable and compatible with the underlying clay body. The resultant surface textures, colors, and adhesion strengths are analyzed to determine the overall effectiveness of the engobe.

Keywords: Ceramic Decoration, kaolin, pigment,

1.0 INTRODUCTION

For many years, the practice of ceramic decoration has held a significant place in human history, as demonstrated by the intricate designs and bright hues on the pottery of past civilizations. Presently, ceramic artistry remains abundant, with both skilled artisans and

industries striving to discover creative methods for elevating their ceramic works' aesthetic appeal. An essential method utilized for this purpose is engobe paint, a distinct ceramic slip that has the power to beautify and reshape the surface of clay objects.

Containing colorants, various oxides, and other additives, engobe is a liquid clay mixture that is commonly referred to as engobe paint. When applied to greenware or ceramics that have undergone a bisque firing, this mixture can serve several purposes. Aside from providing consistency for glazing, engobe paint can also add texture, color, and depth to the ceramic's surface. Moreover, it can improve the clay's workability during throwing and shapingSamoilenko, N., Baranova, A. (2017). Creating engobe paint is a careful and artistic endeavor that requires a thorough knowledge of chemical interactions, firing methods, and raw materials.

Hoskins, A. (2017). explained that the use of engobe expanded to encompass both functional and artistic applications. Greek pottery, famous for its exquisite black-figure and red-figure painting techniques, often featured the application of engobe as the base layer. To begin the production of engobe paint, the first step involves selecting high-quality raw materials. Typically, a fine-grained clay body forms the base of the engobe. These clays possess excellent plasticity and compatibilsity with the underlying ceramic surface. Additional ingredients such as feldspar, talc, and silica may be added to modify the engobe's properties and firing behaviour.

Castela(2010), reported that engobe paint is prepared, it undergoes testing on sample pieces to evaluate its performance during firing. Factors like firing temperature, duration, and atmosphere are meticulously controlled to prevent issues like color distortion or warping of the ceramic body.

The application of engobe requires skill and precision, as it can significantly impact the final appearance of the ceramic piece. Some artists may prefer a single-color application, creating a clean and uniform base for glazing or further decoration. Others might use engobe as a canvas for intricate designs and patterns, showcasing their artistic flair and storytelling abilities.

The production of engobe is a dynamic and essential process in the realm of ceramic decoration. This introductory exploration of the topic has highlighted the significance of selecting quality raw materials, understanding the interplay of colorants, and executing precise mixing and testing

methods. As artists and industries continue to innovate, the art of engobe application has undoubtedly evolve, breathing new life and vibrancy into the world of ceramic art and craft.

For ceramic coating, the foremost consideration is the fit of engobe. The substrate is significant as well, but not as crucial as the former. Bonding effectively and avoiding damage is paramount for the success of engobe. A strong cohesion is necessary for a satisfactory outcome. When the coefficients of substrate and engobe are akin, a particular result can be achieved. During ceramic bonding, the coefficient of thermal expansion (CTE) can affect the substrate's connection to the engobe. Vitrification occurs at about $1000^{o}C$ when firing. This process results in the partial vitrification of the engobe layer, providing it with chemical durability. Obtained is a product that boasts great mechanical strength Celebi (2015).

The objective of the research was to formulate the ideal engobe composition for ceramic products in order to provide a variety of colors for a more aesthetically pleasing appearance.

1.1 Scope of the Study

The scope of the study is limited to Production of Engobe for Ceramic Decorative ware All the raw materials that were use was explore from some selected locations within South Western part of the country on the basis of availability and accessibility. Kaolin and Ball clay that was be use for this study was gotten from Ikere in Ekiti State.

2.0 LITERATURE REVIEW

The review of the literature is a summary of the studies relevant to this work in accordance with the stated objectives. These include the procurement and availability of raw materials, of particular interest being kaolinite, Feldspar, recycled glass, zircon and stain pigments, the composition and processing of materials and body formulation; and how heat can affect the phase composition of the raw materials mentioned.

2.1 Introduction:

Engobe, a traditional ceramic decoration technique, plays a crucial role in enhancing the aesthetic appeal of ceramic products. Engobes are clay-based coatings that are applied to the surface of ceramic objects to achieve various artistic and functional effects. This literature review

explores the production of engobe and its significance in ceramic decoration, shedding light on key insights and methods employed in the ceramic industry.

2.2 Engobe Composition and Ingredients:

The composition of an engobe varies based on the desired aesthetic and functional properties. Typically, an engobe consists of clay, feldspar, silica, colorants, and other additives. The type of clay used can influence the engobe's plasticity and color response (Hoskins, 2017). The combination of ingredients must be finely tuned to achieve the desired texture, color, and adherence to the ceramic surface.

2.3 Importance of Engobe in Ceramic Decoration:

Engobe serves multiple purposes in ceramic decoration. Firstly, it provides a smooth, even surface for painting or other decorative techniques, allowing artists to create intricate designs and patterns. Secondly, it can act as a barrier to prevent the underlying clay body from showing through the glaze or under subsequent layers of decoration. Lastly, engobe enhances the vibrancy of colors and can be used to create intricate designs, patterns, and relief textures on ceramic pieces (Singh & Reddy, 2019).

2.4 Production Methods:

The production of engobe involves several steps. The raw materials are mixed to create a homogeneous slurry, and the engobe is applied to the ceramic piece, typically through techniques such as brushing, dipping, or spraying. The thickness of the engobe layer is carefully controlled to achieve the desired effect. The engobe layer must be dried thoroughly before firing to ensure proper adhesion and to prevent cracking (Hoskins, 2017).

2.5 Colorants and Pigments:

The color of the engobe is a critical aspect of ceramic decoration. Various metal oxides, such as iron, cobalt, and copper, are used as colorants to achieve different hues and shades. The firing temperature and atmosphere also play a role in determining the final color of the engobe. The selection of colorants and the firing process significantly influence the overall aesthetics of the decorated ceramics Aytepe, Eren,& Erdem (2015)

2.6 Recent Advancements and Trends:

In recent years, there has been a growing interest in developing eco-friendly engobe compositions by reducing the environmental impact of ceramic production. Researchers are exploring alternative raw materials and processing methods to achieve sustainable engobe production (Mason and Clark, 2021).

3.0 MATERIALS AND METHOD

Material:Ball clay, kaolin, recycled glass, and feldspar are the materials used in this inquiry. Feldspar, ball clay, and kaolin were obtained from Auchi, Edo state Nigeria, while recycled glass was gotten from campus health centre site within the campus at the Federal University of Technology, Akure.

Methods:The excavation of the study area's raw materials resulted in their packing, bagging, and transportation to the laboratory for experimental analysis. To reduce the amount of moisture in the ball clay material and make the pounding and grinding of the materials easier, the material was first sun-dried for two weeks. After using a mortar and pestle to break up any lumps, the dry samples were further ground into extremely small particles by utilizing a grinding machine. The materials for sanitary ware were first broken into smaller pieces to make them easier to pulverize, and they were then sieved through a 150-micron mesh after pulverization. All the ingredients were weighed out and added to the balling mill when it was dry to start reducing the particle size. The homogeneous mixture was then used to create the test sample.

4.0 RESULT AND DISCUSSION

4.1 Source for raw materials that was be used to formulate an Engobe Bodies

Half bag of ball clay and kaolin were collected within Auchi, Edo State Nigeria. The feldspar and quartz were gotten from Ilorin, Kwara State, the ball clay and kaolin that was gotten was allowed to dry for 3 days before grinding into powder form and then seized into smaller particle sizes using 150 microns. Other materials such as zircon, recycled glass was gotten in processed form, the zircon was purchased from Ahmadu Bello University Zaria Kaduna, Nigeria. while recycled glass was gotten from

4.2 Produce an Engobe using Locally Source Materials

The composition for the researcher was modified from Mason & Clark (2021). which is kaolin 25%, feldspar 20%, Recycled glass 20%, and Zirconium 5%. The composition used for this research which is sample A had 10% Kaolin, 40% feldspar, 40% Recycled glass and 10% Zircon. sample B had 20% clay, 30% feldspar, and 50% Recycled glass, sample C had 30% kaolin, 50% feldspar, 20% Recycled glass and 0% Zircon, sample D had 20% kaolin, 20% feldspar, 30% Recycled glass and 30% Zircon and sample E had 50% kaolin, 10% feldspar, 20% Recycled glass and 20% Zircon.

Table 1: Composition Table with designation.

Samples	Clay (%)	feldspar (%)	Recycled glass (%)	Zircon (%)
A	10	40	40	10
B	20	30	50	-
C	30	50	20	-
D	20	20	30	30
E	50	10	20	20

Source: Researcher Fieldwork

4.3 Test the Uniqueness of Produced Engobe.

The produced engobe was applied on some biscuit ware in other to get the required result, the produced engobe was in two colours, this was to test it uniqueness. The applied engobe ware was allowed to dry before stalking it into the kiln. The kiln was close up and it was pre-heated to about 300ºc before giving it a full blasting to about 1050ºc.

Fig 1: Test Sample

4.4 Decorate ceramic –pieces using produced Engobe.

Different pattern and design were applied using the result gotten from the produce engobe, the engobe was mixed homogenous before it was applied on bisque ware. The application of the engobe on bisque ware was done using brush in order to archive a good result.

Fig 2: Fired Sample

5.0 Conclusion

In conclusion, the production of engobe for ceramic decoration is an intricate and creative process that lies at the heart of the ceramic arts. Throughout this exploration, we've uncovered the fundamental elements that contribute to the success of engobe production. Engobe, often referred to as slip, is the canvas upon which ceramic artists paint their visions. It is a versatile medium that allows for the infusion of color, texture, and intricate designs into ceramic creations. Material selection, experimentation, safety measures, and equipment choices all play vital roles in the journey of producing engobe. Consistency and reproducibility are essential for ceramic practitioners seeking to create uniform and visually appealing ceramic pieces. Achieving this uniformity demands a precise understanding of mixing techniques, application methods, and firing processes.

Singh& Reddy (2019). said engobe can be made to be matt, dull and shining, sample 2 had a matt color output compare to other sample, sample four had a shining output while the rest looks dull. It is advisable to use a saggar to fire any engobe ware in order to achieve a better result.

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