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## RESEARCH ARTICLE

### ACCESS TO TILE OF CERAMICS COVERING BY GLASS PAINT (GLAZE), USING LOCAL CLAY, AND BY USING ONE HEARTBURN.

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#### Abstract

Search headed to solve the economic problem facing producers of ceramics from the local earthenware, by reducing the amount of energy used in the production of ceramics in general. It has been choose ceramic tile as kind of ceramic product to apply experiments, research headed to reduce the amount of energy used by shortening the two phases of the fire, which has the maturity the body and glaze in a single stage. This was done through the work of some of the amendments and additions to the local clay, which gave it the thermal qualities of different managed to burn the body with glaze burned one.

The application on clay tile, size: 10 cm × 16 cm . The surface is divided into four parts, applied four different types of glazes. the tile burned one at a relatively high temperature which is 1050 degrees Celsius. The experiment was successful, and the results showed some of the aesthetics of the colored surface. And had discussed the results and made recommendations.

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#### Introduction:-

The local earthen clay needs two phases of the fire to produce ceramic that is covered by glaze. as it is known. this represents a material burden and time-consuming, but it has to be two phases. as the energy one of the requirements that are used in the production process. it is a consumer for money and time, so this research headed to try to reduce this burden, the experiments were to try to reduce the two phases of the fire to a single-stage fire, by studying the ceramic materials and elements then , there were impacts on the clays and then conduct experiments. the results and how to use them were studied, and there is recommendations of the research.

#### Aim of the research:-

The research aims to access a ceramic tile covered by ceramic glaze with one burn, by processors addition of improved materials for local clay, and study results in terms of specifications and aesthetics of porcelain.

#### Research importance:-

The importance of this research represented in the economic importance of saving time, labor and energy used during the stages of production of ceramic tile.

#### Research methodology:-

Followed by empirical research and descriptive analytical approach by conducting laboratory experiments on the local clay and analysis of the results and description.

**Research hypotheses:-**

Research assumes the possibility of reducing the time and cost of production of ceramic tiles from the local earthen clays, and it is covered with a layer of glass (glaze), using burning one instead of two, and may lead to a new technical specifications can benefit from it.

**Research problem:-**

The problem of research is the high cost for produce ceramic with layer of glaze, and factory of local clays is , thereby hindering the artistic process and the Hail to the many artists and producers without achieving technical and industrial goals.

**Research steps:-**

The idea of the research is to get a glazed tile through the burning one, it was necessary to study the following:

- ❖ local clay.
- ❖ Improve the local mud specifications.
- ❖ Conduct experiments.
- ❖ Discuss the results.

**First:**

Study the most prevalent locally earthenware clay for experiments on them, were selected from each: Aswan clay, and ball clay. they are most prevalent in Egypt, alumina in the form of kaolin is a major component along with some impurities such as iron into the Aswan clay, which gives it the red color. While the ball clay is characterized by gray color, and high plasticity.

**Second:-**

Study the reasons for the need for a first burn before applying the glaze:

Expansion and contraction for each of clay and glaze who are incompatible, resulting in pressure on the body of clay, so it is damaged because it has the mechanical strength is not sufficient.

Accordingly, Therefore the research aim to change the local mud specifications to increase the mechanical strength .

**Applications:**

Some practical experiments were conducted on the Aswan clay and Ball clay to improve thermal properties to get the clay that has the ability to cover with glaze and burn once.

It was obtained the following results:

The possibility of the application glaze on the mud body and burn it once. **(Picture 1)**



**(Picture 1)**

**Formation:-**

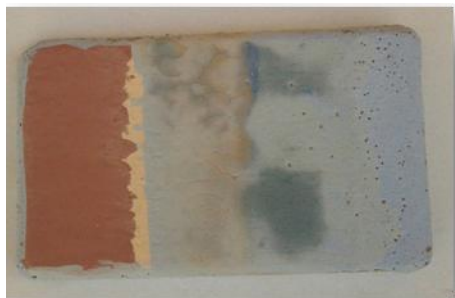
The formation of clay by pressure into molds in the form of tiles and dried to be ready for the application of various glaze. it has been shown to able the formation of clay and droughts without the appearance of cracks or breaks

Size: 10 cm × 16cm. (picture2)



(picture2)

After completion of the drought has been applying different coatings of frit glaze on surface to test if the tile is able to one burn with glaze. (picture3)



(picture3)

The removal of part of paint to follow-up color and the properties of the body after burn at 1050 ° C. (picture4)



(picture4)

**First glaze:-**

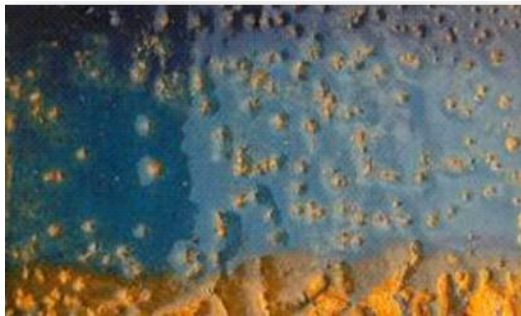
It has been applied to the surface of the tile before burn. (picture5)

it was homogeneity, and showed holes due to the porosity of the body, and it may be due to the light coating.

The color after burn: light blue glaze, the settlement was confirmed the holes giving a beautiful texture and shows distinct clay from glaze holes. It was burned at a temperature of 1050 ° C. (picture 6)



(picture5)



(picture 6)

**Second glaze:-**

The second application of glaze on the surface of the tile, was very homogeneous during the application, it was drought without the presence of any cracks or holes or other. (picture 7)

after one burn glaze was obtained homogeneous, color was opaque black glaze and covered the surface of the tile completely without the appearance of cracks or holes or other. It was burned at a temperature of 1050 ° C. (picture 8)



(picture 7)



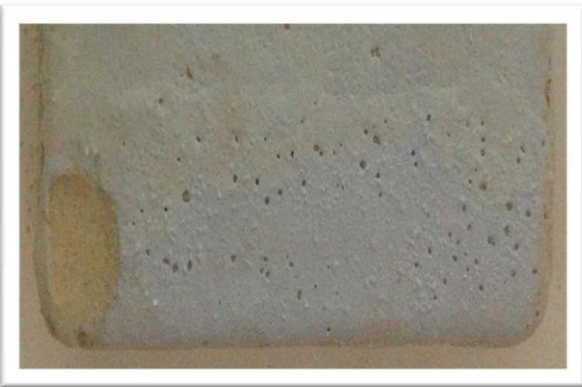
(picture 8)

**Third glaze:-**

It is a former glaze processing has been applied to the surface of the tile. Thickness is suitable, the emergence of small holes in the glaze after the drought was observed, (picture 9).

these holes reveal the surface of the tile. It was burned at a temperature of 1050 ° C

The result: Black glaze has small holes, revealing to the surface of the tile. (picture 10)



(picture 9)



(picture 10)

**Fourth glaze:**

Glaze was prefabricated been applied appropriately but cracking clearly shows after the drought, due to the large difference between the contraction coefficients of glaze and clay. (picture 11)

Cracking has increased after the fire and turned into a beautiful texture with special technical nature, where glaze cracked gathered with part of the surface of the clay, formed color thickness. It was burned at a temperature of 1050 ° C. (picture 12)



(picture 11)



(picture 12)

**Discuss the result:-**

- ❖ The possibility of the formation of improved clay as a tile, and the plasticity of clay suitable for the formation by pressure.
- ❖ no crackle ,or break or any defect is shown, during drying
- ❖ clay is not adversely affected during and after the application of glaze before clay settlement .
- ❖ burning the tile directly after dry at  $1050^{\circ}\text{C}$  it has been settled (biscuits) and glaze together without the appearance of any defects on the body which shows that the tile passed all the stages without the emergence of any defects .

And it could be argued that he could produce a glazed ceramic tile using a burning one using local clay.

**First glaze:-** some small holes in blue glaze appeared during the droughts, it became more visible after the settlement, and showing the color of the body through it, giving desirable artistic effect.

**Second glaze:-** a former processing glaze is homogeneous during application and remained so after drying and after the settlement, giving glossy black color and adherent well with the surface of the tile, which shows:

- ❖ The existence of the common bond between the glaze and the surface of the tile, which consists of alumina, the main component of clay and one glaze ingredients.
- ❖ Homogeneity of the surface of the glaze shows the match between expansion and contraction coefficients for each of the body of the tile and applied glaze , suggesting the possibility of producing the tile using industrially suitable coatings.

**Third glaze:-** some very small holes appeared in black glaze during the drought, and it became more visible after the settlement and nested so that the body color which does not appear, giving artistic effect.

**Forth glaze:-** has some cracks appeared during the droughts of the glaze, and increased after the settlement, showed the body from behind it clearly, giving artistic effects can be codified and take advantage of them, with the absence of any negative effect on the body.

**Economic feasibility of the production of this tile:-**

**Energy:-** is to provide a measure of energy equivalent to the consumer in the glaze settlement .

**Employment:-** provide the necessary labor for unloading operations after the oven biscuits stage and restacking glaze after the application as well as the necessary transport and preparation for the application stage employment after the first heartburn.

**Time:-** provide the time needed to unload and re-stacking oven to the glaze stage as well as the transport and preparation for the stage after the first heartburn.

**The cost:-** total cost goes down as a result of reducing the previous items.



The following table and graph shows the desired savings in both of energy consumption, employment is required, time cost, and stages.

Clay	Energy consumption	Employment is required	Time	Cost	Stages
Clay 1	3	4	4	11	4
Clay 2	1	3	3	7	3

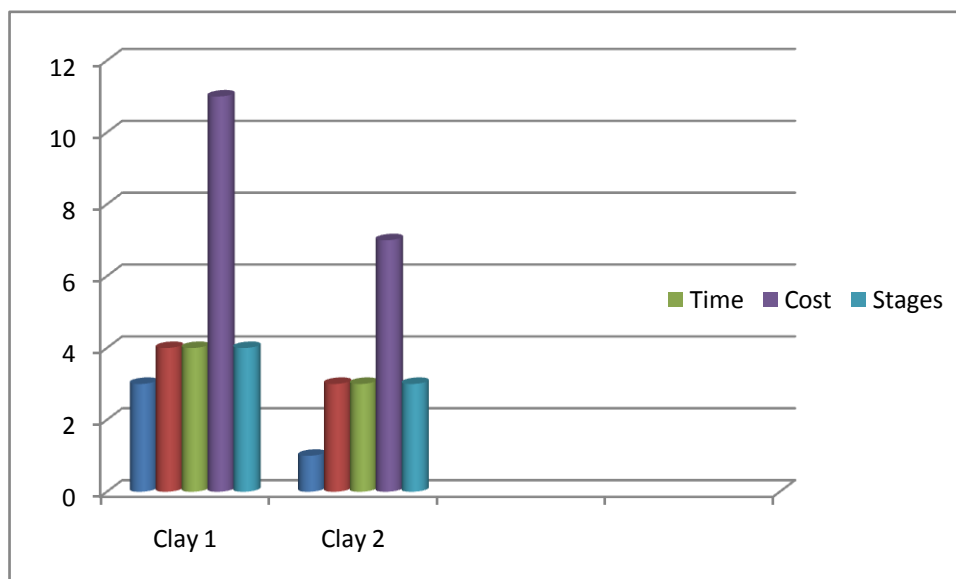


Diagram shows the feasibility processor clay in terms of cost and energy saving, employment and time

### Recommendations:-

- ❖ study of artistic influences resulting from some different paint, interpret and try codified.
- ❖ Study the possibility of using this type of clay in the quantitative production.
- ❖ The work of the feasibility study for the use of this mud in the production of quantitative tiles.
- ❖ study the chemical changes and follow the thermal behaviour of the clay.
- ❖ examine the possibility of producing large tile in terms of area.

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