

## **DECORATION USING THE CLAY CURD TECHNIQUE TO PRODUCE CERAMIC PATTERN**

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### **Abstract:**

The research sought to study the art of ceramics, its raw materials, techniques and its development. This study included decoration using the clay curd technique and its application to Iraqi clays, as it was concerned with introducing the potter to the mechanism of producing sour clay through the use of local raw materials and how to produce clay curd using primary compounds and raw materials and the mechanism of applying it to red clay. Its plastic condition, and two mixtures of clay curds were used to produce curd that is compatible with red clays, and the first mixture was (Iraqi Kaolin, Flint, Soft Croque) which showed unsatisfactory results when the sample dries up and this is what prompted the researcher to find a second mixture (Iraqi Kaolin, Croque, Flint and soda ash) which showed good results after drying, burning and glazing.

As for the theoretical framework, it included a study of an introduction and a historical overview of the use of curd in Iraq, clays and some of their types, ceramic glass and some coloring oxides that were limited to research, and decoration.

The clay curd was prepared and applied as an ornament to the samples and the samples were burned twice at temperatures (950 ° C and 920 ° C). Transparent glass and tinting oxides were added to it and burned again at a temperature of (920 ° C).

The homogeneity of three samples appeared and the lack of separation between the clay curd layer and the ceramic body, and the glazing with colouring added to the samples more aesthetically in terms of appearance, texture and lustre.

### **Research problem:**

The potter sought to find easy alternatives with good results and high aesthetics, and one of the most important of these techniques is the decoration of curd, which is characterized by ease of implementation, speed and accuracy, but this technique puts the potter at the forefront of hardship, which is the difference in longitudinal shrinkage or contraction and mismatch that leads to the separation of the curd from the body to produce curd clay compatible with Iraqi clays.

### **Research importance:**

- The importance of the research lies in studying how to produce clay curd and the potters' use of it in highlighting the aesthetic values of artistic works

### **Research objective:**

- Learn about the use of curd clay technology on Iraqi clays.

### **Theoretical framework:**

#### **Classification of clays:**

- 1- **Primary clays:** They are known as basic clays because they remain in the site of their formation, that is, in the place of the mother rocks from which they originated and which are not transmitted by natural factors. Therefore, their grains of varying size are mostly large and white in colour and are characterized by their high burning temperature, unevenness and lack of plasticity. Among these clays is (Chinese clay) which is known kaolin.<sup>(1)</sup> As follows:
  - **Kaolin:** It is the result of the final analysis of the minerals of feldspar and acidic igneous rocks remaining near the mother rocks where they were formed in the form of irregular sediments of clay.<sup>(2)</sup>  
Kaolin is considered one of the clays of high purity, its chemical formula is  $(\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O})$ , as it contains a high percentage of kaolin mineral, and the mineral crystals consist of thin flat sheets with an almost hexagonal shape (pseudo-hexagonal) with an average crystal size (0.7) microns and a thickness of (0.05) (Micron) These crystals consist of groups known as the book, where they are stacked one on top of the other<sup>(3)</sup>  
Kaolin is white clay consisting of soft, easily friable, relatively low-plastic masses, with good thermal properties of up to 1780 ° C. It also becomes white after burning.<sup>(4)</sup>
  - **Chinese clay:** It includes pure white kaolin and Chinese clay that is similar to kaolin in its qualities, but it is distinguished from it by its purity. Its grains are smaller than kaolin and have good plasticity. It is used to lighten ceramic objects because it is whiter "when burning."<sup>(5)</sup> Chinese clay or English kaolin is the trade name for kaolin prepared from the Kurnool stone, originally imported from

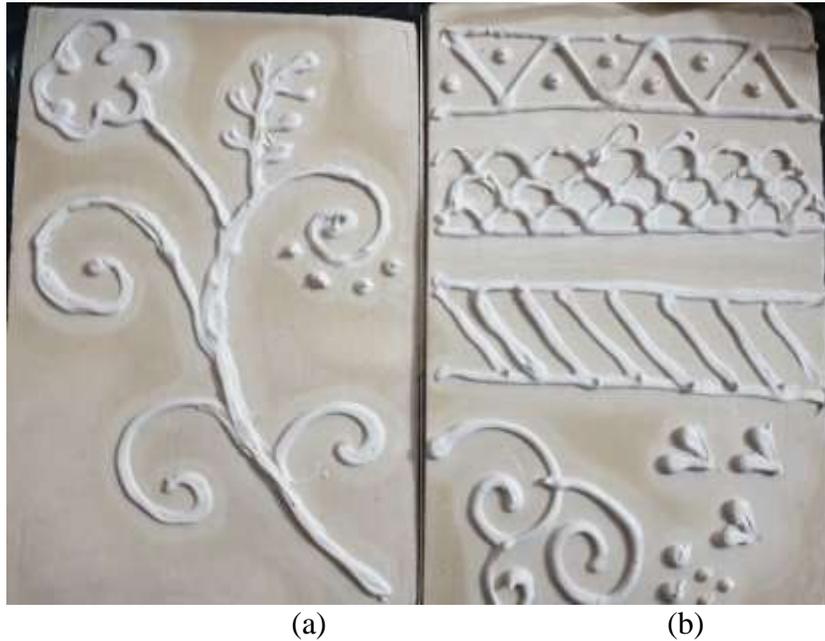
China, and it can also be prepared from any other natural kaolin, and is considered a very fine and amorphous white powder.<sup>(2)</sup>

- 2- **Sedimentary clays:** They are clays that are moved to new places far away from their formation sites, that is, the place of the mother rocks from which they arose and which were transported by natural factors such as wind, water and rain. These clays contain impurities and mineral materials that moved with them, so they are more viscous than the primary clays and are sometimes called the mineral clay because they contain elements Small minerals as crystalline grains, and from these clays are hydrated aluminum silicates.<sup>(6)</sup>
- **Ball-clay:** This type of clay was called this name because it collects in the form of balls, and it was discovered in one of the mines in England, and it is secondary clay that moves with water, which causes its grains to crumble to be small in size due to their passage over the rocks during its transmission. The color of the clay balls is from light gray to almost black. When burning, their color is from white to creamy.<sup>(7)</sup>The spherical clay is considered in the second degree, as it begins to process the most flexible mud and has high shrinkage in and at it, as it becomes ready at its temperature (1260-1370 ° C).ball clay and kaolin clay are common ingredients of porcelain.<sup>(1)</sup>
- **Fire clay:** consists mainly of kaolin, and iron has a very small percentage, up to 20% of the percentage of quartz, and is devoid of alkali and other smelting aids. Refractory clay is durable and does not crumble when subjected to repeated heating and cooling processes.<sup>(2)</sup>Refractory clay is used to produce fire bricks that are used in building furnaces, making shelves, and thermal tools used in the installation of furnaces. It is a heat-resistant mud in which the percentage of silica is less than alumina and when burned, it acquires a gray or brown color.<sup>(6)</sup>
- **Rocky clay:** This type of clay contains an appropriate amount of feldspar that is combined with plastic clay and thus gives good shaping properties and after burning a body that is "relatively non-porous" and is easy to work with, so it is commonly used among potters and from this property its name came and that kaolin is the main mineral for it accompanied by Silica and feldspar<sup>(8)</sup>. This clay possesses the properties of both spherical clay and fiery clay, so it is very practical and when it reaches its hardness it is yellowish-white in colour and progresses to brown colours upon burning at a temperature of (1205-1260 ° C).<sup>(1)</sup>
- **Bentoniteclay:** It is a clay from the group of mont morillonite and its chemical formula is (AL<sub>2</sub>O<sub>3</sub>.4SiO<sub>2</sub>.H<sub>2</sub>O) and the size of its particles is very small. The most important asset of its formation is from the decomposition of the ash of volcanoes and it is found in the United States of America and is considered a bonding clay, its shrinkage is high and absorbs water about three to five times its volume, making it used to purify liquids and remove the color from oils as it is used in the manufacture of coatings in order to prevent plankton from sedimentation.<sup>(8)</sup>

**Procedures of the practical part:**

**Forming models:**

- Two rectangular pieces were formed with dimensions (19 \* 12) as in Figures (1) (a and b):  
The clay curd used was added according to the amounts of the second mixture by means of decorating the cake on the clay bodies as in Figures (1).



**Fig 1: shows the clay curd used according to the amounts of the second mixture by means of decorating the cake on the clay bodies.**

- Forming a dish (1) with diameter (30) as in Figures (2), by a template  
The clay curd used according to the amounts of the second mixture was added by syringe to the clay body as in Figure (2)7



**Fig 2:** show add the used clay curd according to the amounts of the second mixture by syringe.

**Drying models:** The models were left until the next day covered with a piece of cloth and away from any airflow after that, they were left uncovered and away from any airflow until they were completely dry.

**Burning models:**

The models were placed in an electric oven measuring (30 x 37 x 45) cm, as in Figure (3). The oven was heated slowly in order to ensure that there was no moisture in the body in order to avoid any defect in the mud bodies, and the temperature was raised. Gradually to 900° C according to the following :

- From room temperature to 50 ° C within five hours.
- From 50 ° C to 250° C within four hours.
- From 250 ° C to 500 ° Ct with in five hours

The burning time is 9 hours, the average temperature is raised by 50 degrees per hour, and after a temperature of 950 is reached, it is left for an hour for the purpose of completing the burning process well.



**Fig 3: Electric oven**

**Cool models:**

After reaching the maturity temperature, the oven is cooled slowly while leaving the ventilation holes and the control open to a temperature of 600 ° C, after which the oven is cooled naturally.

**Glazing:**

The researcher used transparent glass on four samples in order to make a comparison between the results that the researcher would obtain from the samples to which the glass was applied, by spraying technology, where the researcher converted the glass solution into a spray by means of a special spray gun and was directed to the surface of the pottery pieces and the thickness of a layer was The glass is about (1 mm). As in Figure (4).



**Fig 4: Special air gun with spray technology.**

### Results and discussion:

The results of the outer surface of the samples were discussed, by producing clay curd mixtures and applying them to local clays. The proportions of the components were changed to find the best results that serve the hypothesis of the research. The current research contains (3) samples that were produced using clay transformers.

In the sample as show in the figure (5), the second mixture was used on the sample, which is a plastic one without wetting the surface of the sample, and after drying it, the researcher found that the decoration applied using the clay curd was not deformed, which prompted the researcher to burn it at a temperature of 950 ° C and glaze it with a layer thickness of (1 mm) with the addition of a ratio of ( 3 grams) of cobalt oxide into the glass during spraying, and it was returned to the oven and burned again at a temperature of 920 ° C. This resulted in a sample decorated with clay stains and colored bright blue without deformation of the sample.



**Fig 5: Show second mixture was used on the sample, which is a plastic one without wetting the surface of the sample.**

In the sample as show in the figure (6), the researcher used the second mixture on the sample, which is elastic, with wetting the surface of the sample before applying the curd to it and after its drying, the researcher found that the decoration applied using the clay curd was not deformed, which prompted the researcher to burn it at a temperature of 950 ° C and glaze it with a layer of thickness (1 mm). With a percentage of (3 g) of manganese oxide added to the glass during spraying, it was returned to the oven and burned again at a temperature of 920 ° C, resulting in a sample decorated with clay curds and colored in bright coffee color without deformation of the sample.



**Fig 6: Show second mixture on the sample, which is elastic, with wetting the surface of the sample before applying the curd.**

In the sample as show in the figure (6), was applied to the sample, which is a plastic one with wetting the surface of the sample and after drying it, the researcher found that the decoration applied using the clay curd was not deformed, which prompted the researcher to burn it at a temperature of 950 ° C and glaze it with a layer of thickness (1 mm) with the addition of (3g) of cobalt oxide into the glaze during spraying on the edges of the sample, and it was returned to the oven and burned again at a temperature of 920 ° C. This resulted in a sample decorated with clay stains and colored bright blue from the sides without deformation of the sample.



**Fig 7: Show second mixture on the sample, which is elastic, with wetting the surface.**

#### **Conclusions:**

- The clay curd was produced in harmony with the Iraqi lands, and a harmonious decoration was obtained, and it did not separate from the ceramic body even after two burns at a temperature (900 ° C and 920 ° C).

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