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Research Article

Wall system Design Moisture Resistance utilizing Glazed Brick by use of Copper Filings

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Abstract

View the important role of the surface for the bricks aesthetic and mechanical characteristics and its products. this study has been focus of the use of copper filings waste resulting from industrial processes (metals machining) to paint the brick surface of the standard bricks product of one brick plants at different ranging copper filings from (1-6%) of the glazed mixture. Furnace was used under the temperature of 12000C for glazed mixture. two stages were used to get the desired product, the first layer of white paint of TiO2, and then followed by a final layer of copper filings, results show the gradient of surface color of the golden yellow of the dark brown and flexural resistance of the bricks product was 0.1-0.6 J. The two types of brick glazed were denoted by (A) and (AB) that include of partial glazed by copper layer, and fully glazed of double layers by TiO2 and copper layers respectively.

Keywords: *glazed, bricks, resistance, copper, TiO2, bending, and impact*

1. Introduction

Glazed brick can be used in both interior and exterior applications, as accent brick or as the field brick covering the entire facade, as shown in the fig. above. Glazed units have been integral parts of buildings for decades and have performed well under all climatic conditions. Glazed brick are often selected for use because of the many characteristics that make them distinct among brick products. One of these is the wide variety of colors that are not available in standard brick production. These may be applied to special shapes or brick of different sizes to further enhance visual interest. It is even possible to apply multiple glazes to a single brick unit. Glazes may be clear, translucent or opaque, and are available in almost any color with a glossy, satin or matte finish. Glazed brick also provide an impervious surface that is extremely durable and resistant to staining which results in easy maintenance. Resistance to scratching and abrasion, as well as fire resistance of the glaze, also enhance the durability of glazed brick units. (7)

Glazes have been used for centuries to improve and modify the surface properties and appearance of ceramics. The basic properties of glazed ceramics are well-known. However, changes in ceramic processing, and the increased demands for ware in service, call for improved understanding of glazes and their properties. (Linda, 2007)

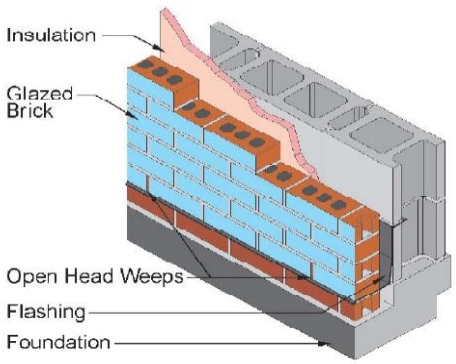
Raw glazes are used on clay-based ceramics fired at temperatures above 1200 °C. The high temperatures are required in order to ensure a completion of the raw material reactions during firing. (1 and 2)

An understanding of the correlation between raw material reactions and firing cycle is important for ensuring desired physicochemical properties of the final glaze surface

Oxide composition gives the limits for glaze formation in typical firing processes. In fast firing especially, the reactions between the minerals in the raw materials should be taken into account to achieve a desired phase composition for the fired product. (3 and 4)

A careful selection of the starting raw material mixture is therefore essential for achieving the desired surface composition for the product. (Hortling , Jokinen)

Surface topography, i.e. surface roughness and waviness, largely depends on the phase composition and microstructure. A matted surface has a higher surface roughness than a glossy surface. (6)



Mechanical properties, e.g. abrasion resistance, bending strength, impact strength are important for the maintenance of functionality and appearance of the glazed surfaces during continuous and longtime wear. (5 and 6) This study has been focus of the use of copper filings

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waste resulting from industrial processes (metals machining) to paint the brick surface of the standard bricks product of one brick plants at different ranges copper filings from (1-6%) of the glazed mixture.

The high optical reflecting properties for different glazed layer is achieved, although TiO2 is nucleating agent but has good reflecting properties of UV light which extended and exciting the reflecting heating and light in the surroundings which reached up to 70%. 8, 9 this results agree with 11.

These results provide a cost effective solution to glazed applications as well as a good moisture resistance.

2. The aim of this work

The aim of this work is:

1. Study the effect of different types of glazed ceramic layers on the bricks system.
2. Improving the mechanical properties such as (hardness, bending and impact resistance) for these glaze systems.
3. Improving thermal – physical properties of prepared system by these additives.
4. Comparison which additive has optimum properties.

3. Experimental

A. Preparation of raw materials (minerals)

Produce samples in the same characteristic of standard bricks. Local (Babylon) clay was used for this purpose. The chemical composition of this type of clay is as shown in table (Linda , 2007).

Table1 The chemical composition of the local clay (Linda, 2007)

SiO2	42.75
Al2O3	12.53
Fe2O4	5.97
CaO	14.35
MgO	4.78
S4O3	1.32
K2O	1.9
Na2CO3	1.31
L.O.I	14.75

B. Glaze composition oxide

Basic oxides (RO, R2O) are used to prepare the glazed layer. The composition of this mixture is as shown in the Table (BIA, 2006).It prepares of addition of copper fillings with different ratios from (1 - 6%) and TiO_2 according to the prepared samples.

Table (2-A) the composition of the glazed slurry (mixture)

$Na_2O.2B_2O_3.10H_2O$	Borax (Rem)
Copper filling	1- 6 %
TiO_2	0

Table (2-B) the composition of the glazed slurry (mixture)

$Na_2O.2B_2O_3.10H_2O$	Borax(Rem)
Copper filling	1- 6 %
TiO2	6

C. procedure of glazed samples preparation

The kinds of the glazed samples were made by using the samples of bricks made of the same types of the selective clays after processes of (drying of clay, molded and firing at 1000^{o}C). The produced bricks were painted by using the mixing of (Borax glass, Copper filling) according to the rule of (Herman, Seeger). Different glazed bricks were prepared with varying value of Copper fillings from (1-6%) sample were fired at (850-900)^{o}C for one hour.

4. Result and discussions

Comparative studies comprise that the Impact resistance and bending distortion are affected by the layers type and content of glazed materials where both of impact and bending strength are increased with increasing percentage for both of glaze particles especially materials additive of TiO_2 in case of (AB). The cross section of samples after ruptured demonstrate homogeneously and dense with fine grains; these results agree with (1, 6, and 7) and lead to fact that such as kind of bricks will enamours keys for building and ornamental for long life while it free of cracks and production defect. Expectantly, these results provide a cost effective solution to glazed brick applications.

1. Impact strength

Figures (Linda ,2007) shows the effect of (Cu) additive glaze layer which mentioned by (A) on impact strength of different composition ratios and particles of (TiO_2) which mentioned by (AB) for all fixed prepared composite brick samples on the mechanical property impact strength in (N.M). It is shown that values of impact strength of (A) fillers are increased with the increasing of (Cu) percentage and particles fillers of (TiO_2) with improvement results for overall brick hardness systems due to high chemical compatibility i.e. improvement with additive of TiO_2 due increasing of the fusion temperature of emulsion (TiO_2), specially at the value more than 4% as show in the figure (Linda, 2007) that shows the effect of TiO_2 with comparison of the sample with partial glazed by Cu. (10)

2. Bending test

The results of this investigation are in agreement with results found by some authors (10) who showed that the effect of different concentration ratios of prepared samples in terms of bending distortion in (Mba) versus additive percentage of the copper oxide for the two group (A) which represents the surface coated as shown in figure (BIA , 2006) which results in major effects on the quality and mechanical properties. As well as figure (BIA ,2006) shows same behavior of the primary filler particles of (TiO2) with high bending resistance in (Mba) versus

additive percentage which attributes to the chemical compatibility between bulk of brick and filler particles (TiO2).(10)

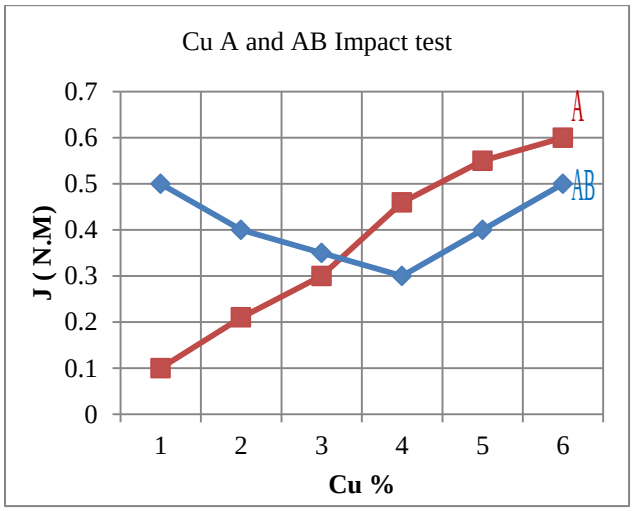
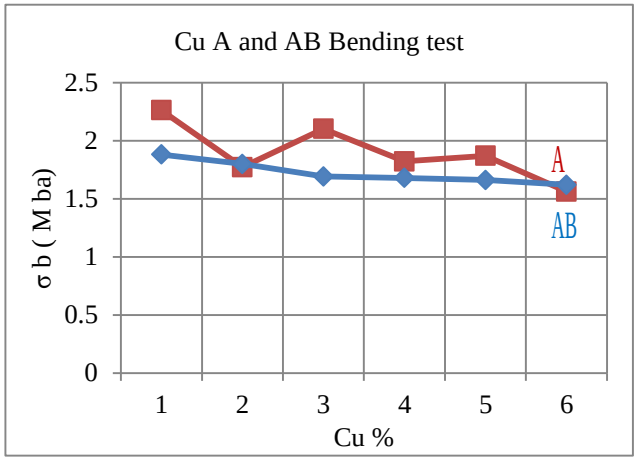


Figure Effect of glaze additive on impact strength of A and AB glazing system (Linda, 2007)



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