



Cairo University

# **PHYSICAL AND MECHANICAL PROPERTIES OF META-KAOLIN GEOPOLYMER BRICKS**

By

**Shereen Mustafa Bakr**

A Thesis Submitted to the  
Faculty of Engineering at Cairo University  
In Partial Fulfillment of the  
Requirements for the Degree of  
**MASTER OF SCIENCE**  
In  
**Structural Engineering**

FACULTY OF ENGINEERING, CAIRO UNIVERSITY  
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Under the Supervision of

**Prof. Dr. Osama Abd El-Ghaffur  
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**Title of Thesis:**

PHYSICAL AND MECHANICAL PROPERTIES OF META-KAOLIN  
GEOPOLYMER BRICKS

**Key Words:**

Fly Ash, Pottery Powder (Meta-Kaolin), Silica Fume, Geopolymer Bricks.

**Summary:**

Cement industry is one of the most polluting industries due to the emission of carbon dioxide and other gases that pose a serious health hazard. Therefore, geopolymers are used as an alternative to cement. Geopolymers are widely used in concrete and bricks. This research is exposed to use pottery powder with fly ash and silica fume at different ratios for the manufacture of geopolymer paste. The chemical and physical properties of the previous materials were examined with the use of x-ray diffraction devices. Sodium hydroxide was added, and liquid sodium silicate as alkaline activators for chemical reaction under curing conditions in a thermal oven at 3 days. Fifteen samples were formed with the ratio of w/b = (0.3-0.5- 0.4). The samples were tested by the scanning electron microscopy which showed confirmed results of the samples. The results of the resistance tests of the samples showed that the addition of fly ash as a result of the samples With a percentage of 90% and pottery powder by 10% of the total weight of the solid materials. The sample increases the compressive strength by up to 3 times compared to the samples containing fly ash and pottery powder by 50% and 50% equally. Adding pottery powder in different ratios raised the compressive values of bricks up to 194 kg/cm<sup>2</sup>



## **Disclaimer**

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name:

Date:

Signature:

## **Dedication**

I dedicate my thesis to my parents (**Mum, Dad**), my sister (**Eng. Shaza Mustafa**), my brother (**Eng. Muhamed Mustafa**), **Eng. Muhamed Gamal**, and anyone who supported me in this research. They are the reason why I am doing this thesis in the first place.

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