

### INVENTORS

MUKRIZ MD MOHTAR  
 MOHD MUSTAFA AL BAKRI ABDULLAH  
 KAMARUDIN HUSSIN  
 MOHAMMAD TARIZI SELIMIN  
 MUHAMMAD FAHEEM MOHD TAHIR  
 AESLINA ABDUL KADIR  
 NUR SYARMIRA CHE AZIZ  
 NURANI CHE PIH

### CONTACT DETAILS

Centre of Excellence Geopolymer &  
 Green Technology (CEGeoGTech)  
 School of Materials Engineering  
 Universiti Malaysia Perlis (UniMAP)  
 P.O. Box 77, D/A Pajabat Pos Besar  
 01000 Kangar, Perlis, Malaysia  
 E-mail: mukriz@unimap.edu.my

# GEO-CLAY BRICK: GREEN UNFIRED CLAY GEOPOLYMER HIGH STRENGTH BRICK

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## PRODUCT DESCRIPTION

The infrastructure such as buildings for housing, industry and the facilities for handling water and sewage will require large amounts of construction materials. Since the large demand has been placed on building material industry especially in the last decade owing to the increasing population, there is a mismatch between demand-supply management of these materials. In 2012, based on International Trade Centre statistics, it is reported that Malaysia has imported over 49,094 million USD of construction materials (Item Product: 6902 Refractory bricks, blocks, tile & refractory ceramic construction materials). Therefore, there is a need for Malaysians to be able to produce an efficient and green building materials especially bricks to fulfil our internal demand.

## PROBLEM STATEMENT

Clay brick is one of the most important materials for construction industry. The basic advantages of the clay brick are good aesthetic appeal (natural earth red colour), high thermal & acoustic insulation, zero maintenance cost, exceptional fire resistance and flexible in application. Clay bricks manufacturing process start with raw materials preparation, bricks making process, setting & drying process and followed by firing/sintering at high temperature before packaging. The main problem in the manufacturing process is the firing challenges; where it requires high temperature (1000°C – 1300°C) and takes 7 – 10 days, highly sensitive to weather, quality of bricks is hard to control, kiln need to repair or rebuild for every 6 months, kiln can collapsed if the bricks contained too much humidity and limited supply of rubber trees/woods used to burn the bricks. Furthermore, the clay brick production industry is a major source of air pollution in developing countries. It is estimated that the brick industry produces 22% of the CO<sub>2</sub> emissions by the construction sector. Therefore, **UNFIRED** clay brick appear to be an optimal solution for this problem. Published data on unfired clay brick shows variation of techniques have been applied to produce similar quality/properties depicted by commercialised fired clay bricks; nevertheless none of them were 100% successful.

On the other hand, geopolymerization is a widely acknowledge method to produce a green cement. Geopolymer can exhibit a variety of characteristics including high compressive strength, low shrinkage, acid and fire resistance, low thermal conductivity etc. Despite having all the advantages, an unfired clay brick using this technique is not yet been discovered.

## NOVELTY/ INVENTION

A novel unfired clay brick using top soil as raw materials is specifically designed to replace commercialized fired clay brick as construction material to preserve our environment. Geo-Clay Brick is formulated using geopolymerization process provides high compressive strength and possesses the same advantages as the commercialised fired clay bricks which is not found elsewhere.

## PRODUCT ADVANTAGES

- 1) Eliminate firing process, less CO<sub>2</sub> emission.
- 2) No use of non-renewable resource.
- 3) Shorter curing period - reduce overall production time of clay brick production.
- 4) Comparable to the commercial fired clay brick with compression strength of 25MPa.



Figure 1: Non-Shabby Sultan Abdul Samad building (1897) using fired clay bricks as main construction materials.

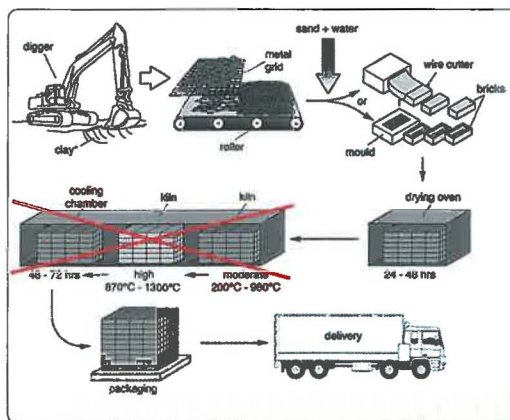


Figure 2: Process flow of Clay Brick Production



Figure 3: Traditional Kiln



Figure 4: Unfired GEO-CLAY BRICK

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