

# ADVANCES IN MATERIALS ENGINEERING

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## Volume 1

Edited By:  
Zahurin Halim  
Iskandar Idris Yaacob  
Md Abdul Maleque



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## The Effect of Fibre Content on Thermal Property of Coir Fibre Reinforced Cement-Albumen Composite

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**Keywords:** coir fibre, cement, concrete, thermal conductivity, composite, albumen

**Abstract.** The effect of fibre content on the thermal property of the fibre reinforced concrete with addition of egg albumen as the matrix material was focused in this study. It is to enhance the heat insulation performance in buildings. The coir fibre reinforced cement-albumen composite (CFRCAC) with different fibre contents (0 to 6 wt.%) and 65 wt.% albumen fraction was casted and cured into specific mould sizes of 12 in x 12 in x 1 in for Thermal Guarded Hot Plate Machine and 12 in x 12 in x 0.5 in for Heat Insulation Box. The thermal property of the fabricated samples was investigated in accordance with MS 1532:2002. It is found that the value of the thermal conductance of the sample is twice comparable and lower compared to normal concrete. Further increment in fibre reduces the thermal conductivity of CFRCAC. Moreover, the effect of density of CFRCAC with thermal conductivity was also evaluated.

### Introduction

The utilization of natural resources in the construction industry has been encouraging due to ecological concern. On the other hand, the use of egg albumen is proved to increase the strength of the natural fiber concrete as the protein network in the egg albumen plays an important role in providing mechanical properties of the encapsulating matrix [1].

Coconut or coir fibres have the potential to be used in composites as reinforcement for different purposes such as in concrete [2]. Coir fibres which are extracted from the coconut tree (*Cocos nucifera*) [3] are abundantly available, cheap, strong, less brittle and durable [2,4]. The high lignin content makes the fibres stiffer and tougher and allows them to be resistant to rotting and obtains better tensile strength [5]. The central hollow cavity known as lumen acts as an acoustic and thermal insulator since its presence decreases the bulk density of the coir fibre [6].

Due to the increasing climate temperature, home owners had spend a lot of money in electrical energy consumption such as fan and air-conditioning. From the point of view of energy saving, a development of material with low thermal conductivity value is a promising act to lower the energy consumption in building. The addition of fibre that introduced voids in the structure of the concrete has significantly to slow heat loss and reduced heat transfer in the building [7]. Thermal property of the material is vital as it measures the material ability to transfer heat. Moreover, incultation of the coir fibre also believed to affect the thermal properties of the concrete [6, 8].

Degradation of coconut fibers at high temperatures has been investigated before their incorporation into cementitious matrices in order to obtain insulating material for construction [9]. A fiber-based soil–cement block using coconut coir with low thermal conductivity was developed and compared to commercial soil–cement blocks and the corresponding decrease of thermal conductivity and weight are reported fairly significant [10].

Therefore, an assessment of thermal characteristics in coir fiber albumen concrete composites is presented. This paper is organized as such in the next section is experimental method and the rest of