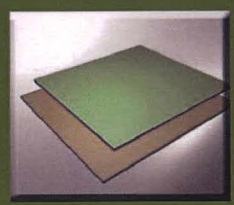
# ADVANCES IN COMPOSITE MATERIALS



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Chapter 014

# Oil Palm Empty Fruit Bunch (OPEFB) for Lightweight Composites Concrete

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**Keywords:** Concrete, composite, albumen, empty fruit bunch, fibre.

**Abstract:** The main aim of this chapter is to produce a lightweight composite concrete from oil palm empty fruit bunch (OPEFB) fibres with the intention to substitute the ordinary heavy and brittle concrete. The composite concrete contained OPEFB fibres as reinforcement whilst albumen as a binder. The composite mixture was casted and cured for 28 days before being tested for psychical tests, namely, density, moisture content and water absorption as well as morphological analysis. The volume fraction of fibre varies between 0, 1, 2, 3, 4, 5 and 6 wt. % while egg albumen maintains its optimum volume fraction at 65 wt. %. The mixture was in accordance with composite 'Rule of Mixture'. The OPEFB composite concrete generated low density cement composite with the lowest density value of 0.90 g/cm$^3$ at 5 wt.% fibre fraction with 3.46% and 15.18% for moisture content and water absorption respectively.

## Introduction

The usage of natural fibre as reinforcement in the concrete somehow assists the world in reducing the number of biomass waste, open burning as well as cost in producing concrete. For example, despite the economic benefits that Malaysia obtains as one of world largest palm oil exporter [1-2], the industry produces tons of biomass products. Waste produces by oil palm industry includes palm shell, fibre, empty fruit bunch (EFB), trunk and frond [2]. In fact, OPEFB fibre (*Elaeis guineensis Jacq*) [3] can be utilized as reinforcement in cement based application with encouraging results [4]. It is as an alternative effort for the rapidly expanding construction industry to reduce concrete production cost with enhanced concrete performance.

Density is one of the important parameters which can control many physical properties in cement composite and it is mainly controlled by the amount and density of fibres [5]. Increment in moisture content and water absorption of the natural fibre leads to higher affect in the mechanical and physical properties of composite [6]. It results in poor wettability with matrix which leads to a weak interfacial bonding between the fibre and the matrix.

On the other hand, albumen can act as a binder, encapsulating the fiber and produces networking protein that bind fiber and cement particle thus reduce the moisture and water absorption [7]. In this chapter, the report is only focused on the development of the OPEFB albumen composites, coupled with the study of their physical properties as density, moisture