Chapter 7
Effects of Palm Oil Fuel Ash as Micro-Filler on Interfacial Porosity of Polymer Concrete

ABSTRACT
The effects of palm oil fuel ash (POFA) as micro-filler on interfacial porosity and pore size distribution of polymer concrete (PC) is the main aim of this chapter. Beginning with a brief introduction about the topic, the materials and method used in this study are explained. Two categories of fillers were involved in this study, fine-micro filler (ground POFA and is paired with calcium carbonate), and coarse micro-filler (unground POFA and is paired with silica sand). It is revealed that the replacement of overall types of micro-filler at different filler content decreased the average pore diameter of PC significantly, except for PC incorporating unground POFA. Additionally, incorporation of fine-micro filler with dispersion characteristic could significantly reduce the interfacial porosity of PC as compared to incorporation of coarse micro-filler in PC.

INTRODUCTION
Polymer concrete (PC) has resins instead of cement as a concrete binder. The hardening of PC occurs without any water and polymerizes when added with additives, catalysts or accelerators. Additionally, since thermoset materials are hydrophobic materials, therefore, presence of water and high moisture content in aggregates has to be avoided especially during production of PC to enhance the compatibility and interaction between materials.

DOI: 10.4018/978-1-5225-8325-7.ch007

Copyright © 2019, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.
Effects of Palm Oil Fuel Ash as Micro-Filler on Interfacial Porosity of Polymer Concrete

Generally, PC products become cost-effective especially when they contain micro-filler. Fillers normally come either from the natural sources (mineral filler) or are synthetically produced. However, the depletion of natural resources has become a concern, therefore, many researchers have shifted to use synthetic fillers, though this choice is more expensive. With the consideration for both environmental issues and sustainable development, utilization and modification of waste materials has become an interesting topic of research in modern production of polymeric materials. This had been initiated in the 1980s when fly ash was first studied and then further explored in the 1990s (Ohama, 2007). To date, the effectiveness of fly ash in enhancing the performance and durability of PC is proven, and is preferred for being cost-effective, toxic free and able to give good original fineness with low thermal coefficient. Moreover, it is readily available and is compatible with other materials in resin (Atzeni et al., 1990; Varughese and Chaturvedi, 1994; Gorninski et al., 2007).

This overview gives motivation to researchers to investigate the potentiality of Palm Oil Fuel Ash (POFA) usage in different types of concretes. Over the last few decades, the palm oil industry has grown up significantly in Southeast Asia such as Malaysia, Indonesia, and Thailand, and became an important agricultural-based industry. It is of no exemption to Africa where one of the major crops is also palm oil. This positive development was the reason for the researchers to utilize POFA in the cementitious system. However, POFA is a waste from agricultural plant and any agricultural based material has natural cellulose structure (Raveendran et al., 1996; Kaddami et al., 2006; Hafizah et al., 2014). This structure causes the PC to become hydrophilic, which also leads to very high and uneconomical resin consumption. Moreover, it deteriorates the PC quality even when fillers are used. Additionally, it becomes highly challenging in terms of reducing interfacial porosity in PC as well.

The objective of this study was to investigate the potentiality of POFA in reducing interfacial porosity in PC with low binder content using Mercury Intrusion Porosimetry (MIP) test. There existed several studies which were conducted by previous researchers that dealt with POFA in normal concrete. Therefore, two types of POFA were used in this study to compare their significant types in PC, i. e., ground and unground POFA. Additionally, ground POFA was paired with calcium carbonate as fine micro-filler, while, unground POFA was paired with silica sand as coarse micro-filler. All fillers were involved to investigate the function of filler on interfacial porosity. This work should eventually benefit researchers and fabricators in the field of PC production.
Comprehensive Evaluation for Mortars and Concretes Incorporating Wastes
Alberto Marcelo Guzmán, Noemí Graciela Maldonado and Graciela Affranchino
www.igi-global.com/chapter/comprehensive-evaluation-for-mortars-and-concretes-incorporating-wastes/215680?camid=4v1a

Supply Chain Analysis
www.igi-global.com/chapter/supply-chain-analysis/74677?camid=4v1a