

Effects of Pineapple Leaf Fibre as Reinforcement in Oil Palm Shell Lightweight Concrete



Siew Choo Chin , Mun Lin Tang, Norliana Bakar, Jia Ling Che, and Shu Ing Doh

Abstract This paper presents the mechanical behaviour of pineapple leaf fibre (PALF) in oil palm shell (OPS) lightweight concrete (LWC). Various fibre volume fractions were considered which include 0.5%, 1.0%, 1.5% and 2.0% of PALF. In this study, the PALF was extracted and treated with sodium hydroxide solution with a 10% concentration. The length of the PALF was made constant as 40 mm based on the optimum fibre length obtained from previous work. The experimental testing in this work includes slump test, compressive strength test, splitting tensile test and four-point bending test. Results showed that the compressive strength decreased at all ages with an increase in PALF volume fraction, whereas improvement in strength was observed in both splitting tensile strength and flexural strength. The inclusion of PALF increases the tensile and flexural strength up to 3.28 MPa and 6.55 MPa respectively. The findings revealed that 1.0% PALF is the optimum fibre volume ratio for tensile and flexural strength. The oven-dry density and demoulded density of all OPS concrete mixes fall within the range of 1526–1731 kg/m³ and 1787–1853 kg/m³ which are in the range of structural lightweight concrete. The splitting tensile strength of OPS and PALF reinforced OPS-LWC in this study falls in the range to that of conventional concretes. Flexural strength to compressive strength ratio showed that all PALF reinforced OPS concretes had ratios ranging 12–22% which were greater than the usual range for lightweight aggregate concrete. Hence, this indicates that PALF fibre can improve significantly the flexural strength of OPS lightweight concrete.

Keywords Fibre · Lightweight concrete · Pineapple leaf · Reinforcement

S. C. Chin (✉) · M. L. Tang · N. Bakar · S. I. Doh
Department of Civil Engineering, College of Engineering, Universiti Malaysia Pahang, 26300 Gambang, Pahang, Malaysia
e-mail: scchin@ump.edu.my

S. C. Chin
Centre for Research in Advanced Fluid and Processes (Fluid Centre), Universiti Malaysia Pahang, 26300 Gambang, Pahang, Malaysia

J. L. Che
School of Civil and Hydraulic Engineering, Ningxia University, Ningxia 750021, China

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