

Green Concrete for Sustainable Indonesia Structures: Lightweight Concrete Using Oil Palm Shell as Coarse Aggregate with Superplasticizer and Fly Ash

Authors : Feny Acelia Silaban

Abstract : The development of Indonesia's infrastructure in many islands is significantly increased through the years. Based on this condition, concrete materials which are extracted from natural resources are over exploited and slowly becoming rare, thus the demand for alternative materials becomes so urgently crucial. Oil Palm is one of the biggest commodities in Indonesia with the total amount of 31 million tons in the last 2014. The production of palm oil also generates lots of solid wastes in the form of Oil Palm Shell (OPS). Constructing more environmentally sustainable structures can be achieved by producing lightweight concrete using the Oil Palm Shell (OPS). This paper investigated the effects of OPS and combination of Superplasticizer and fly ash proportion of lightweight concrete mix design to the compressive strength, flexure strength, modulus of elasticity, shrinkage behavior, and water absorption. The Oil Palm Shell had undergone special treatment by washing it with hot water and soap to reduce the oil content. This experiment used four different proportions of Superplasticizer with fly ash and 30 % OPS proportion from the weight of total compositions mixture by the result of trial mix. The experiment result showed that using OPS coarse aggregates and Superplasticizer with fly ash, the average of 28-day compressive strength reached 30-35 MPa. The highest 28-day compressive strength comes from 1.2 % Superplasticizer with 5 % fly ash proportion samples with the strength by 33 MPa. The sample with proportion of 1 % Superplasticizer and 7.5 % fly ash has the highest shrinkage value compared to other proportions. The characteristic of OPS as coarse aggregates is in a standard range of natural coarse aggregates. In general, this lightweight concrete using OPS coarse aggregate and Superplasticizer has high potential to be green-structural lightweight concrete alternative in Indonesia.

Keywords : lightweight concrete, oil palm shell, waste materials, superplasticizer

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