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CHARACTERIZATION AND EVALUATION OF ALKALINE ACTIVATED MORTARS SYNTHESIZED FROM BINARY AND TERNARY BLENDS OF PALM OIL FUEL ASH, GROUND GRANULATED BLAST FURNACE SLAG AND FLY ASH

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UNIVERSITI SAINS MALAYSIA

2018

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by

OTHMAN MOSBAH MOHAMED ELBASIR

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LIST OF SYMBOLS

GHG	green house gasses
SCMs	supplementary cementitious materials
MDS	Maximum Distance Separable
Eq.	Equation
ECC	Error Correction Capability
CWT	Continuous Wavelet Transform
pdf	probability density function
QoS	Quality of Service
PR	Perfect Reconstruction
UEP	Unequal Error Protection
MRC	Maximum-Ratio Combining

LIST OF ABBREVIATIONS

ASTM	American Society for Testing and Materials
BS EN	British European Standards Specification
POFA	Palm oil fuel ash
G-POFA	ground palm oil fuel ash
t-POFA	Treated palm oil fuel ash
f-POFA	Fine palm oil fuel ash
u-POFA	Ultrafine palm oil fuel ash
FA	Fly-ash
GGBFS	Ground Granulated blast furnace slag
MK	metakaolin
OPC	Ordinary Portland cement
AAB	alkaline activated binder
AAS	alkali activated slag
XRF	X-Ray Fluorescence
XRD	X-Ray Diffraction
FTIR	Fourier transforms infrared spectroscopy
FESEM	Field Emission Scanning Electron Microscopy
EDX	Energy dispersive X- ray
DTA	Differential Thermal Analysis
TGA	Thermo-gravimetry Analysis
LOI	Loss on Ignition
MPa	Mega Pascal
C–S–H	Calcium silicate hydrate
N–A–S–H	Sodium aluminosilicate hydrates
C–A–S–H	Calcium aluminum silicate hydrate

PENCIRIAN DAN PENILAIAN MORTAR TERAKTIF ALKALI DISINTESIS DARIPADA CAMPURAN BINARI DAN TERNARI ABU SISA KELAPA SAWIT, SANGA RELAU BAGAS DAN ABU TERBANG TERBANGERGRANUL DAN ABU TERBANG

ABSTRAK

Abu bahanapi kelapa sawit (POFA) dengan kehalusan yang berbeza (t-POFA, f-POFA dan u-POFA) memberi kesan kekuatan mampatan dan mikrostruktur mortar yang berasaskan POFA alkali teraktif. Campuran mortar ultrahalus POFA (u-POFA) alkali teraktif menunjukkan kekuatan mampatan yang tertinggi yang diukur antara 7 dan 28 hari. Pelbagai teknik penganalisaan (XRD, FTIR, dan FESEM-EDX) yang dilakukan pada sampel menunjukkan wujudnya pembentukan C-S-H dan N-A-S-H. Perbandingan telah dibuat secara individu untuk POFA, FA dan GGBFS sebagai mortar alkali teraktif menggunakan kaedah Taguchi. Keputusan kajian menunjukkan bahawa kekuatan mampatan tertinggi pada 28 hari rawatan secara individu POFA, FA dan GGBFS sebagai mortar alkali teraktif adalah masing-masing 41.20 MPa, 51.14 MPa dan 93.97 MPa. Kekuatan mampatan yang tinggi ini boleh dikaitkan dengan pembentukan pengikat gel (C-S-H dan N-A-S-H) dalam mortar alkali teraktif, seperti yang dibuktikan oleh analisis XRD, FTIR dan FESM-EDX. Mortar alkali teraktif binari dan ternari daripada tiga bahan (POFA, FA dan GGBFS) menunjukkan peningkatan kekuatan mampatan yang ketara apabila ditambah kepada kira-kira 25% berat u-POFA untuk campuran binari. Walau bagaimanapun, dalam ternari, kekuatan tertinggi diperolehi daripada 40% berat u-POFA, 20% berat FA dan 40% berat GGBFS. Kajian ini mengesahkan bahawa mortar alkali teraktif yang telah dibangunkan dalam kajian ini mempunyai prestasi yang amat baik apabila terdedah

kepada pelbagai persekitaran yang agresif dan menunjukkan kestabilan terma yang tinggi apabila terdedah kepada suhu tinggi sehingga 1000 °C.