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# Microstructural investigation and durability performance of high volume industrial by-products-based masonry mortars



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#### HIGHLIGHTS

- Influence of POCP and IBAA in masonry mortar investigated.
- Microstructural behaviour assessed using SEM and XRD techniques.
- Use of 40% POCP produced better durability performance.
- Use of IBAA up to 50% produced requisite strength in masonry mortar and sustainable.

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## G R A P H I C A L A B S T R A C T



### ABSTRACT

The use of eco-efficient building materials in construction has become a trend in regard to the effort of mitigating the effect of global warming which include CO<sub>2</sub> emission, energy demand, and natural resources depletion that lead to negative environmental impacts. The present study was attempts to investigate the microstructure behaviour and durability performance of masonry mortars. In this context, palm oil clinker powder (POCP) was utilised to replace cement up to 80%, while the incinerated bottom ash aggregates (IBAA) was utilised to replace mining sand up to 100%. Eventually, further investigation was carried out on the durability performance through water absorption, sorptivity, sulphate attack, and electrical resistivity on the ideal mixtures of 40% of POCP (CLP) and IBAA with 50% (CLPI50) & 100% (CLPI) mixtures. As a result, irregular shape of POCP particles in SEM and the presence of high silica in POCP were observed to produce the peaks of portlandite as well as early occurrence of calcite. In this case, IBAA particles have angular, while porous microstructure in SEM and the XRD results showed high peaks of quartz and calcite. The final mixes containing CLP, CLPI50, and CLPI respectively obtained 51, 56, and 61% of 28-day compressive strength of control mix (CL) that was greater than the requisite 12.4 MPa. On another note, the mix- CLP showed better durability performance (6% water absorption, 84 mm/100 cm<sup>2</sup> of IRA) compared to CLPI50 (7%, 89 mm/100 cm<sup>2</sup>), while the drying shrinkage performance of CLP possessed similar trend to that of the CL (0.064%). Finally, the mix CLP managed to produce extremely good electrical resistivity.

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