Investigating the Potential of Clay Brick Waste to Be Used as a Raw Material for Rice Husk Ash-Based Bricks

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Rice husk ash (RHA) and clay are well-known pozzolan materials that can be incorporated to tailor the properties of commercial bricks in the construction industry. Clay brick waste (CBW) is a clay product that is largely generated during mass-scale demolition activities. Although several works reported the use of RHA for developing bricks with improved physical properties, no work investigated how CBW influence the performance of RHA-based bricks. Accordingly, this work investigated how brick waste can be incorporated into RHA-based cement brick and how its properties such as compressive strength, water absorbency and morphology are influenced. For this, untreated RHA (particle size: 63-500 μm), CBW, OPC cement and water were used, and several bricks with dimensions 7×5×3 cm were developed by using different volume mixing ratios. The optimum mixing ratio among constituents was determined based on the brick's porosity, surface finish and de-moulding capability. Results indicate that the optimum volume mixing ratio is 2:3:6:1 (cement: CBW: RHA: water). The RHA content should be less than 13% w/w to ensure de-moulding Having BCBW content of more than 44% w/w is acceptable for a better product, but too high contents around 64% w/w are not desirable as it discourages the removal of the brick for the mould. The brick with the optimum mixing ratio shows a water absorbance of 51% w/w and compressive strength of 3.61 MPa (28 days). Without RHA, the brick maintains the same compressive strength while reducing the water absorbance down to 20%. Compared to bricks reported in the literature using RHA/clay, RHA/lime/cement, RHA/aggregates, the proposed brick has significantly high water absorbency, and the compressive strength is around the reported values. Considering its properties, and the presence of heavy-metal-adsorptive RHA, the brick can be proposed for construction areas where wastewater channels are involved.

***Keywords*:** Rice husk ash; RHA; Clay brick waste; Compressive strength; Water absorbance; Optimum mixing ratio