

Feasibility of a Biopolymer as Lightweight Aggregate in Perlite Concrete

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Abstract : Lightweight concrete is being used in the construction industry as a building material in its own right. Ultra-lightweight concrete can be applied as a filler and support material for the manufacturing of composite building materials. This paper is about the development of a stable and reproducible ultra-lightweight concrete with the inclusion of poly-lactic acid (PLA) beads and assessing the feasibility of PLA as a lightweight aggregate that will deliver advantages such as a more eco-friendly concrete and a non-petroleum polymer aggregate. In total, sixty-three samples were prepared and the effectiveness of mineral admixture, curing conditions, water-cement ratio, PLA ratio, EPS ratio and perlite ratio on compressive strength of perlite concrete are studied. The results show that PLA particles are sensitive to alkali environment of cement paste and considerably shrank and lost their strength. A higher compressive strength and a lower density was observed when expanded polystyrene (EPS) particles replaced PLA beads. In addition, a set of equations is proposed to estimate the water-cement ratio, cement content and compressive strength of perlite concrete.

Keywords : perlite concrete, poly-lactic acid (pla), expanded polystyrene (eps), concrete

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