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Lecture Title: Methodology to Design Eco-Friendly Fiber-Reinforced Concrete for 3D Printing

Abstract :

Greater use of locally available supplementary cementitious materials (SCM) to reduce cement content and the addition of fiber reinforcement can enhance the performance of 3D Printing (3DP) technology in construction. Developing print materials with adequate strength and toughness can improve the cost-effectiveness and sustainability of 3DP construction. In this study, three classes of eco-friendly 3D printable fiber-reinforced mixtures are investigated, namely ultra-high-performance concrete (UHPC), high-performance concrete (HPC), and conventional concrete (CC). A step-by-step methodology is proposed to maximize the substitution rate of cement with SCM and limestone filler and optimize fiber volume for the successful development of 3D printable fiber-reinforced materials. The printability of the fiber-reinforced mixtures is validated using an extrusion-based 3D printer.