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Experimental study on mix proportion and fresh properties of fly ash based geopolymer for 3D concrete printing

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Abstract:

This paper presents the material design and fresh properties of geopolymer mortar developed for 3D concrete printing application. Unlike traditional casting, in 3D printing, extruded materials are deposited layer-by-layer to build complex architectural and structural components without the need of any formwork and human intervention. Extrudability, shape retention, buildability and thixotropic open time (TOT) are identified as critical early-age properties to characterize the 3D printable geopolymer material. Five different mix designs of geopolymer are tested in a systematic experimental approach to obtain a best printable mix and later it is used to print a 60-centimeter-tall freeform structure using a concrete gantry printer to validate the formulation.

Keywords: 3D Concrete Printing; Geopolymer; Rheology and Thixotropic

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