



Development of cement-based mortars for 3D printing through wet extrusion

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Abstract

The construction sector is connoted as an extremely traditional business sector since long ago. However, due to the increase of the global competitiveness, there is a demand on the development of new building materials and construction methods that can bring added value to the companies. The 3D concrete printing is a novel construction approach within digital construction that can offer a higher degree of optimization and flexibility for producing either structures or structural elements with complex geometries. One of the main challenges in the 3D concrete printing using wet extrusion is balancing properly the rheological and mechanical properties of the printable mixtures. In this study, several mixtures were developed and their capability for being used in 3D printing was assessed and discussed based on their rheological properties. The compressive strength of the matrices that could be properly printed are also presented.

Keywords: Digital construction; 3D concrete printing; Wet extrusion; Rheological properties.

1. Introduction

Additive manufacturing or solid free-form construction based on a layered fabrication process is one of the novel approaches based on the application of digitized technologies that are being introduced in the construction industry [1,2]. Although the growth rate of embodying digital technologies within the Architecture, Engineering and Construction (AEC) sector has not been the

same as other more emergent fields, such as aerospace or automotive industry [2], nowadays the digital construction is one of the most promising revolutionary approaches within the construction industry. The main idea of digital construction is solving the existing difficulties in the conventional methods of construction [2,3]. In this case, the 3D concrete printing (3DCP), which is based on additive manufacturing (AM) technique can offer a higher degree of optimization and