CERIS : Civil Engineering Re and Innovation for Sustainability

LowC-Bionic - Organically shaped structures in low carbon concrete produced by 3D printers

Summary

provide organic shape structures, which are performance and mechanical strength.

The following aspects have been studied: (a) the rheology and properties of low carbon, multifunctional and sustainable cement-based colored materials to enable their printing, (b) the topology, through computational processes, for the design of structures with a three-dimensional organic shape inspired by Nature, and (c) the 3D printer. The integration of all these aspects culminated in a low carbon bionic structure prototype, printed in concrete. It was also possible to obtain a structure capable of reacting to the temperature of the environment in which it is inserted, through reversible chromatic changes.

LowC-Bionic was an initiative of a Portuguese company and three research units, holding together required scientific the technological background, with international recognition, in all relevant areas. More specifically, CMP - Cimentos Maceira e Pataias, a company of the SECIL Group, is a national reference in the production of cementitious materials, cements, mortars and concrete,

The LowC-Bionic project is a multidisciplinary CDRsp (IPLeiria) is a reference in the area of project, which aims to develop an advanced additive manufacturing (3D printing), CERENA cement-based material and an automated (IST) is a reference in the area of materials in three-dimensional (3D) printing equipment for general and polymers and adjuvants in concrete, to create an emerging technology to particular, and CERIS (IST, Nova, UCoimbra) is a reference in structural concrete (broad sense), lightweight, through the significant reduction of including formulation, durability, mechanical cement material, but without any impact on characterization, structural evaluation, and image processing, applied to structures produced with cement-based materials.

> Figures 1 and 2 show examples of printed / extruded cement formulations (on-going development).

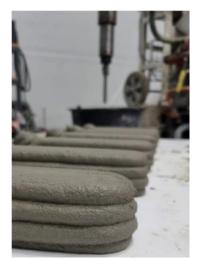


Figure 1. Extruded specimens for compression test based on grey cement — CEM I 42,5R.





Figure 2. Extruded bionic shape specimens based on grey cement — CEM I 42,5R.



Project Reference

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Leading Institution

SECIL – Companhia Geral de Cal e Cimento S.A. (Portugal)

Partners

IST – Instituto Superior Técnico (Portugal), IPLeiria – Instituto Politécnico de Leiria (Portugal)

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253 605.82€

CERIS

126 802.91€

Project Website

https://www.secilgroup.com/pt/inovacao/inovaca o/lowc-bionic