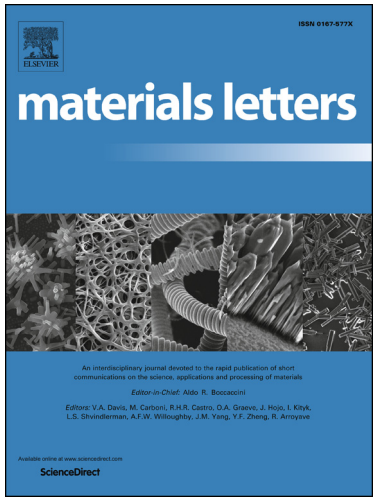

Anisotropic mechanical performance of 3D printed fiber reinforced sustainable construction material

Biranchi Panda, Suvash Chandra Paul, Ming Jen Tan

PII: S0167-577X(17)31167-9
DOI: http://dx.doi.org/10.1016/j.matlet.2017.07.123
Reference: MLBLUE 22965

To appear in: *Materials Letters*

Received Date: 8 July 2017
Accepted Date: 26 July 2017

Please cite this article as: B. Panda, S. Chandra Paul, M. Jen Tan, Anisotropic mechanical performance of 3D printed fiber reinforced sustainable construction material, *Materials Letters* (2017), doi: http://dx.doi.org/10.1016/j.matlet.2017.07.123

Anisotropic mechanical performance of 3D printed fiber reinforced sustainable construction material

Biranchi Panda*, Suvash Chandra Paul, Ming Jen Tan
Singapore Centre for 3D Printing, School of Mechanical & Aerospace Engineering,
Nanyang Technological University, Singapore

Abstract: Around the globe, ground breaking projects and case studies are being presented to showcase the potential of digital fabrication with concrete, better known as 3D printing of concrete. With these explorations, underway, the key quest in 3D concrete printing is for structural stability by means of high strength and ductility. This need could be avoided by designing printable fiber reinforcement concrete or concrete with in-process 'printed' reinforcement. Therefore, in this paper, an experimental investigation was carried out by reinforcing short glass fiber (GF) of different lengths (3mm, 6mm and 8 mm) and percentages (0.25%-1%) in a custom-made sustainable construction material developed for 3D printing application. Thixotropic GF/geopolymer mortar was made using class F grade fly ash and loaded in different directions for measuring it's mechanical properties. Our experimental testing results revealed, improved properties of the printed specimens with increase in fiber percentage up to 1% and an obvious directional dependency behaviour, caused by the layer wise deposition.

***Keywords*:** 3D concrete printing, Fiber reinforced geopolymer, Digital anisotropy and Mechanical properties

---

*Corresponding author's email: biranchi001@e.ntu.edu.sg