Mirza Abdul Basit Beigh – Doctoral Project A3/II

SUSTAINABLE MINERAL-BONDED COMPOSITES FOR STRUCTURAL IMPACT SAFETY – MATERIAL DESIGN AND APPLICATION TECHNOLOGY

1 STATE OF THE ART

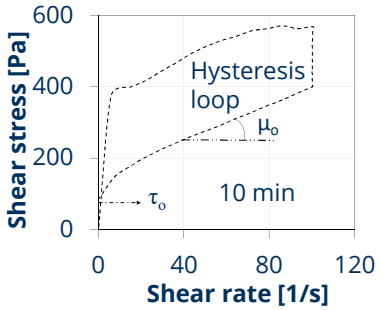
- Sustainable material design using Limestone Calcined Clay Cements (LC3) and polypropylene fibers
- Altering rheology according to the application technique, such as spraying or lamination
- Investigating the influence of application technique on the mechanical properties of the composites

Photos IfB / TUD

2 OBJECTIVES

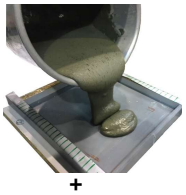
- To develop better production techniques by altering factors such as mixing energy, mixing duration, etc.
- To improve aspects of application technology such as fibre dispersion, effective adhesion in spraying, etc.
- Rheological material characterisation of LC3-based composites, correlating it to the mechanical performance.
- Investigating microstructure, bond strength, matrix porosity, fiber properties etc.

HAAKE MARS – II (unit cell)

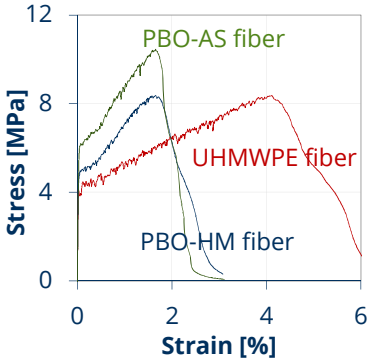


Bingham parameters

- Rheometric tests for determining rheological properties



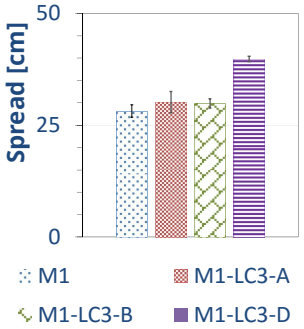
+

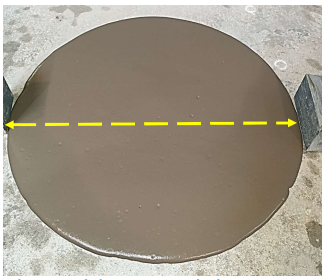


- Targeted material design

Curosu et al. CCR 2017

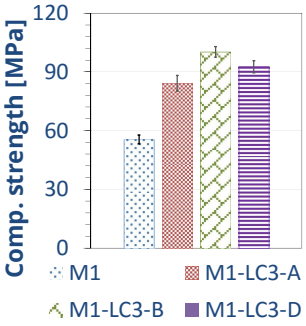
3 CONCEPTS AND CURRENT RESULTS

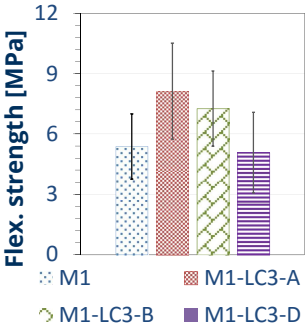




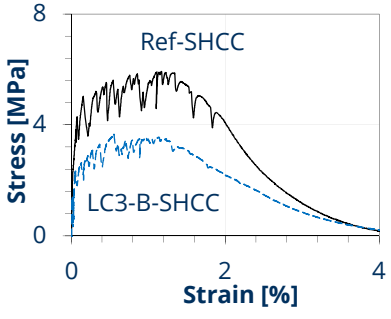
Flow table spread diameter

- Flow table and spread diameter results characterising the fresh-state properties of different LC3 matrix





- Despite LC3 matrix showing higher compressive and flexural strength than the reference matrix, Ref-SHCC yields higher tensile strength than LC3-SHCC and it is under further investigation.



4 PLANNED COLLABORATIONS

- H. Xuan (A1/II): 3D-reinforcing structures with integrated in-situ sensors
- M. Popa (A2/II): Polypropylene fiber and surface modification
- A. Tawfik (A4/II): Material behavior under shear and impact
- F. Bracklow (A6/II): Strengthening on the rear side
- L. Leicht (A5/II): Strengthening on the front side
- I. Salgado (C2/II): Sustainability and resilience evaluation of novel composites