SFB TRR 280 | ITA Institut für Textiltechnik und Lehrstuhl für Textilmaschinenbau | RWTH AACHEN UNIVERSITY

Univ.-Prof.
Prof. h.c. (Moscow State Univ.)
Dr.-Ing. Dipl.-Wirt. Ing.
Thomas Gries
Director

Martin Scheurer
Researcher

19.02.2021

Project title:	Project B02 - Investigation of new material and technology approaches for continuous inline forming and consolidation of textile reinforcements
Partner:	SFB/TRR 280
Duration:	07/2020 - 06/2024
Funding Agency:	DFG

Mission Statement

New digital and continuous manufacturing methods (e.g. 3D concrete printing) enable load-path-oriented (form follows force) and thus material-minimised designs. However, current textile reinforcements are not suitable for continuous production of complex geometries. Due to their offline consolidation, they lose any form flexibility, which is a basic prerequisite for the realisation of complex free-formed structures. Following the example of discontinuous reinforced concrete production, impregnated textile reinforcements in the form of mats, rolls or flexurally rigid preformed reinforcement cages have been developed to date in order to produce prefabricated carbon concrete components using established production processes. A material-specific and technological solution of an impregnated textile reinforcement, which enables an inline integration into new digital and continuous production methods, does not exist until today. However, this is essential for the large-scale utilisation of these new manufacturing methods (3D concrete printing and extrusion). In addition, new discontinuous production methods, such as the folding of concrete in a green stand, will be raised to a new development level by the results. Until now, only unimpregnated textiles could be used for this purpose, which have a significantly lower composite tensile strength.

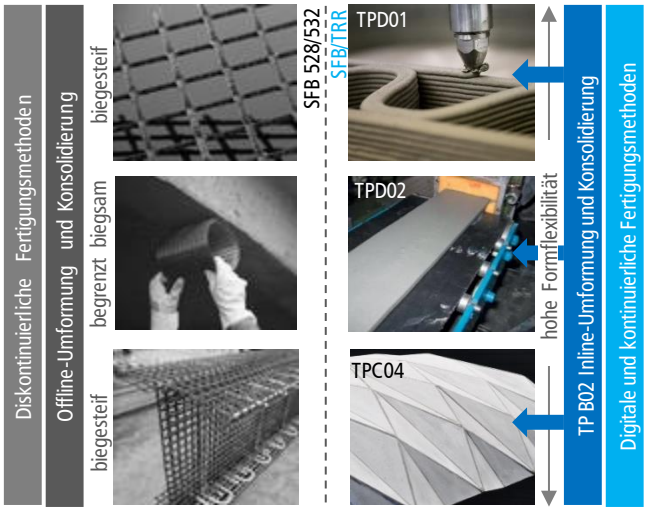

Figure 1: Aim of project B02

Approach

The approach is based on a targeted temporal shift of the forming and consolidation step by means of prepreg resin systems into the new manufacturing processes of the carbon concrete elements. Prepreg systems are pre-impregnated textiles whose consolidation takes place specifically via a predefined curing mechanism at a predefined time. In addition to established curing mechanisms such as heat or UV radiation, new approaches such as activation via the alkalinity of the concrete, microwaves and induction are also being considered for inline production of carbon concrete. In addition to the chemical and physical interactions between the prepreg resin systems and the concrete matrix (keyword: cross-linking kinetics), the influence of the different curing mechanisms on the hydration of the concrete matrix and which process-related limitations exist with regard to geometry and production speeds are also being scientifically investigated.

Acknowledgement

We would like to thank the Deutsche Forschungsgemeinschaft (German Research Foundation, DFG) for funding the research project within the framework of the SFB/TRR 280, project number: 417002380.

Contact

Martin Scheurer
Institut für Textiltechnik der RWTH Aachen University
Otto-Blumenthal-Str. 1
52074 Aachen
Tel.: +49/(0)241/80 234 71
Fax: +49/(0)241 80 224 22
martin.scheurer@ita.rwth-aachen.de