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07.08.2017

Project title: ECO TRM

"Ecologically textile-reinforced composite systems for application in the construction sector"

Partner: Albani Group GmbH & CO. KG, CareCon Co. Ltd, Korea Institute of Civil Engineering and Building Technology

Duration: 11/2016 – 10/2019

Funding Agency: Zentrales Innovationsprogramm Mittelstand (ZIM) of the Federal Ministry for Economic Affairs and Energy

Mission Statement

Increasingly, facades, furniture, and entire prefabricated house modules are manufactured from textile-reinforced concrete (TRC). The low required overlap of 5 mm compared to 50 mm and more for steel-reinforced concrete allows for thinner walls and thus more filigree and resource-saving construction.

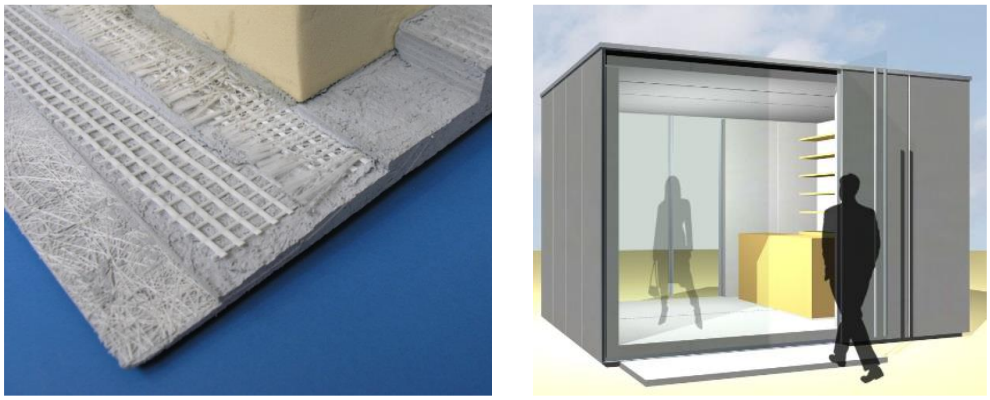

Figure 1: Textile-reinforced concrete (left); Café built in textile concrete modular design (right)

Glass fibres are often used for reinforcement. In order to become alkali-resistant, so-called AR glass fibres, zirconium dioxide is added into the glass batch to provide resistance in the strongly alkaline environment of the concrete. This results in a relatively high selling price for glass fibres, which is 5 to 6 Euro per kilogram for AR glass fibres. Approaches to modify cheaper fibres (e.g. E glass fibres) for use in concrete have so far not been able to establish themselves on the market. Thus, glass fiber as the main cost driver remains the biggest obstacle to even greater market success for the innovative material textile concrete.

Basalt fibres are produced directly from natural stone and are therefore available at a very reasonable price of approx. 3 euros per kilogram. Basalt is a renewable raw material, since worldwide 1 km³ of new basalt is "supplied" annually by volcanoes. Basalt fibres have a very high thermal resistance and an alkaline resistance, which lies between the untreated and the alkali-resistant glass fibre.

At the same time, cement production causes more CO_2 emissions worldwide than all air traffic. The market is currently dominated by concrete as a building material, with all the ecological consequences that production entails. In 2015, cement production in Germany and Korea was 31 and 48 million tonnes, respectively, while production in China was 2.5 trillion tonnes by comparison. With increasing public interest in sustainable solutions and political pressure (Paris Agreement), the demand for environmentally friendly materials is also rising dramatically.

Approach

ECOTRM uses alkali-activated material (AAM) as binder. The AAM matrix system is produced from industrial waste such as ash and slag as a fine aggregate and alkali activator. The use of AAM instead of conventional cement binders for TRM can significantly reduce CO_2 emissions as AAM's raw materials are mainly industrial by-products. Due to the Paris Agreement, the market potential for materials with low CO_2 emissions will increase significantly.

Acknowledgement
We would like to thank the Federal Ministry for Economic Affairs and Energy for funding of the research project as part of the Zentrales Innovationsprogramm Mittelstand.

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