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Use of PCC for innovative refurbishment solutions

Abstract

Concrete is modified with polymers to improve the durability and the adhesive strength and due to that measure, they suit optimal for refurbishment applications. The microstructural changes in the binder matrix were studied. Afterwards it was analyzed how they influence the macroscopic properties. It were performed laboratory tests to better understand the behavior. Different innovative applications were addressed, in addition some examples were shown for the use of PCC for constructional purposes.

Fig. 1# Example for application PCC

Basics of PCC

PCC is mainly used in repair and restoration of concrete constructions, because of its specific properties compared to ordinary cement mortar and concrete. Therefore, organic substances (polymer dispersions, dispersible polymer powders, emulsifiable reaction resins) are added to influence the fresh and hardened properties. Ideally, cement and polymer together fulfil the binder function. Typically, the polymer/cement ratio is between 5 % and 20 %.

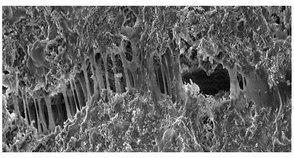

Fig. 2# streched polymer films in the microstructure of PCC (Aspekte der kohäsiven und adhäsiven Eigenschaften von PCC, Dissertation K. A. Bode)

Fig. 3# carbonatization depth of PCC vs. CC

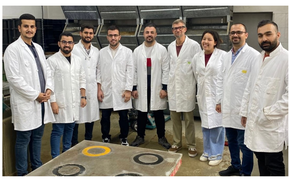

Fig. 4# participants of project 1
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Experimental Program

The fresh properties were determined at 20 °C. Therefore, the slump of the flow-table test, the air void content and the moulded density were investigated.
Compressive strength, flexural strength and Young's modulus were examined in order to measure the mechanical properties of the hardened concrete. In addition, in terms of durability bonding strength and carbonatization depth were determine at the age of 360 days.

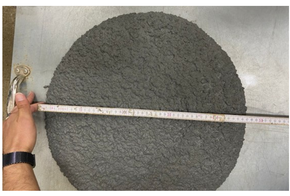

Fig. 5# spread flow (flowtabeltest)

Fig. 6# flexural strength test

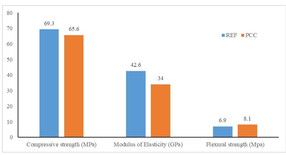

Fig. 7# mechanical proberties

Conclusions

The polymer modification of cement concrete leads to improved flexural strength and durability but reduces on the other side the compressive strength and modulus of elasticity.

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