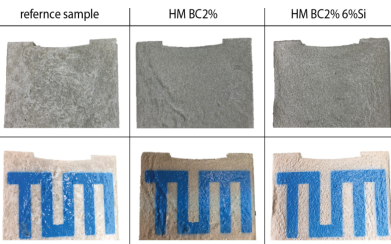


Hydrophobic and durable mortar

Advanced materials for construction and restoration must prove to be both sustainable and durable. Researchers from Technical University of Munich (TUM) have developed a biofilm-enriched mortar with hydrophobic properties. This hybrid material can be supplemented with cement substitutes (SCMs) and also proves to be highly resistant to chemical attack and thermal stress - especially to the freeze-thaw cycles that regularly occur in Central Europe and are a major cause of damage.



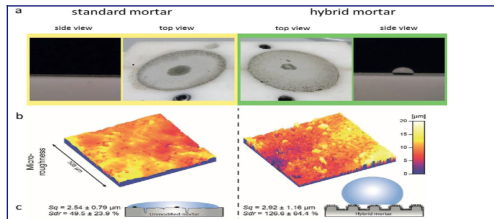
Advanced biofilm-enriched formulation

The biofilm enriched mortar exhibits strong hydrophobic properties by imitating the lotus effect. It shows an increased durability, is not harmful to the environment and can even be painted and is therefore also ideally suited for restorations.

REFERENCES:

- Video
- Publication

- 01 Biofilm creates an hydrophobic effect
- 02 Mechanical strength can be improved by adding cement substitutes
- 03 Highly resistant to sulphate attack
- 04 Ideally suited for construction and restoration



a) Wetting behavior of a water drop on unmodified mortar and biofilm-enriched hybrid mortar. b) light profilometry images. bc - biofilm content, wc - water/cement ratio. Sq values represent the root-mean-square roughness of the samples and Sdr values the developed interfacial area ratio. c) A schematic of the topological changes responsible for the increased wetting resistance of hybrid mortar



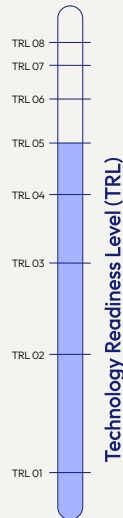
CHALLENGE

The durability of cement-based materials such as mortar and concrete typically suffers from water penetration, resulting in corrosion of steel structures embedded inside the material and therefore to damage and weakness of the building structure. Several techniques and approaches have been developed to minimize the ingress of water in an attempt to increase the lifetime and thus lower the environmental impact of cementitious structures.

INNOVATION

Here a mortar hybrid material is presented where a bacterial biofilm is supplemented, increasing the hydrophobic properties. Bacterial biofilms are ubiquitous communities of bacteria encased in a matrix of self-produced biopolymers. In such a biofilm matrix, the bacteria are able to resist various environmental challenges, e.g., chemicals, desiccation, or removal from surfaces. By adding defined dosages of cement substitutes (SCMs), the mechanical strength of the mortar material can be significantly improved without losing the hydrophobic effect of the biofilm. Furthermore the formulation is highly resistant to sulphate attack.

01 Basic principles observed · 02 Technology concept formulated · 03 Experimental proof of concept · 04 Technology validated in lab · 05 Technology validated in relevant environment · 06 Technology demonstrated in relevant environment · 07 System prototype demonstrated in operational environment · 08 System complete and qualified



An invention of Technical University of Munich



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