ROMA TRE UNIVERSITÀ DEGLI STUDI

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MSc Course in Civil Engineering for natural risk protection
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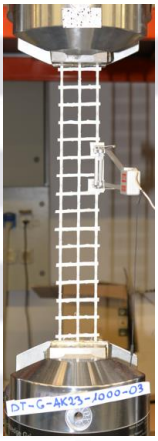
Experimental investigations on the durability of glass-fabric reinforced cementitious matrix (G-FRCM)

Motivations and aims

Mortar-based composite materials (Fabric Reinforced Cementitnious Matrix, FRCM) are used for externally bonded reinforcements (EBR) in civil structures. These systems consist of reinforcement meshes embedded in lime or cement-based matrices. The durability of FRCM materials is crucial for long-term structural safety, cost-effective maintenance, and reliable performance. This issue requires research studies due to limited data on degradation mechanisms in aggressive environments, such as moisture, alkaline exposure, salt crystallization and freeze-thaw cycles.

Methods and results



In this thesis, the durability of a glass FRCM system made with fibre-reinforced lime-based mortar was investigated. Compression and three-point bending tests were performed on mortar prisms cured in water at 23°C for 1000, 2000, 3000, and 9000 hours. Additionally, tensile tests were conducted on yarns, textiles and coupons made with the same mortar, conditioned in water or alkaline environments at 23°C and 40°C, with the same aging durations.
All experimental activities were carried out in the Laboratory of Structures of Roma Tre University, as part of the FRCM experimentation carried out by the international RILEM TC 290 IMC Inorganic Matrix Composites Technical Committee.

Conclusions

The mortars exhibited a 20% increase in compressive strength after 9000 hours of conditioning at 40 °C, indicating ongoing hydration. However, flexural strength decreased by 40%, influenced by fracture mechanisms. In dry fabrics, tensile strength dropped by 20% after 9000 hours in water at 40 °C, while alkaline conditioning at 3000 hours resulted in tensile strength values not less than 90% of the control samples. Tensile tests on coupons showed an initial increase in tensile strength at 1000 hours, followed by a reduction at 9000 hours in water, while in an alkaline environment at 3000 hours, values decrease not less than 90% with respect to control specimens. The system complies with CSLP-STC 2018 certification guidelines and shows promising potential for future applications.