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A. Nobili, C. Signorini

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On the effect of curing time and environmental exposure on impregnated Carbon Fabric Reinforced Cementitious Matrix (CFRCM) composite with design considerations

A. Nobili[a,*], C. Signorini[b]

[a] *Dipartimento di Ingegneria Enzo Ferrari, via Vignolese 905, 41125 Modena, Italy*
[b] *Dipartimento di Scienze e Metodi dell'Ingegneria, via Amendola 2, 42122 Reggio Emilia, Italy*

Abstract

This paper investigates the effect of curing time and aggressive environmental exposure on the mechanical performance of impregnated Carbon Fabric Reinforced Cementitious Matrix (CFRCM) composite. Following the recently published IIC-ES AC434 guidelines, saltwater, distilled water, alkali and acid resistance are investigated together with freeze-thaw cycles. Mechanical characterization is based on tensile uni-axial tests under deformation control of rectangular-base prismatic specimens. 28- and 60-day curing times are considered for the control environment as well as for saltwater and alkali resistance. Deformation is monitored via digital acquisition. Besides uni-axial tests, experimental results comprise optical and scanning electron microscopy, crack pattern analysis and failure mechanism assessment. Focus is set on the determination of the design limits for the composite system at failure for the tested environments and curing times. In particular, a comparison is drawn with established design criteria already coded for FRP systems, which introduce the concept of safety (or partial) factors. Environmental conversion factors are also defined and calculated on a statistical basis in a twofold manner, as a mean to determine the design strain and strength limits of exposed specimens from the control (unex-

*Corresponding author