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Comparative study of repairing concrete using carbon fiber reinforced epoxy composites and bioresources composites

This research investigates the performance of concrete repaired using either commercially Unidirectional Carbone Fiber Reinforced Epoxy Polymer “UCFREP” provided by SIKA company or Unidirectional Flax Fibers Reinforced Bioressourced Polymer “UFRFBP”. The concretes under study are C35/45 resistance class and are mechanically damaged at different rates then repaired. The main objective of this investigation is to evaluate the effectiveness of repairing damaged concrete using bioresources composite by comparison to traditional ones. To hit this target, the developed approaches are both experimental and analytical. The first part of this study is dedicated to the characterization of both resins (determination of the gel point and reticulation duration, glass transition temperature and mechanical behavior), the unidirectional composites used in the repairing process (mechanical characteristics) and the concrete (compressive and damage behaviors). The second part is devoted to the experimental study of repaired damaged concrete loaded under compressive tests. Three different damage rates are applied to the concrete before the reparation. For damage rates, less than 30%, mechanical performances (Compressive resistance, Stiffness, and ductility) are completely restored or even enhanced for repaired concretes using UCFREP composites. A comparative effectiveness of repairing with UFRFBP requires applying two layers on composites instead of one for UCFRE. The third part of this work is dedicated to analytical modeling of mechanical behavior of confined concrete with composite under compression in one hand, and the tensile behavior of the composite in another hand. Using Bioressourced composite for concrete reparation seems to have excellent performances comparable to Carbone one which encourages its application for concrete structures in civil engineering.

Biography

Elhem Ghorbel has completed his PhD at the age of 27 years in materials science and engineering from the National High Engineering School of Mines-Paris. She is Professor at the University of Cergy-Pontoise in the department of Civil Engineering (IUT) since 2003. She has several institutional activities and scientific responsibilities at the national and international levels. Her research interests cover the mix design, the mechanical and fracture behavior of materials (self-compacting and resin concrete, composites, polymers), the valorization of inert and industrial wastes in concrete, the repairing of concrete by composites, the durability of heterogeneous materials (aging, Chemical attacks, biodegradation, and freezing-thawing resistance). She has published more than 50 papers in reputed journals and 100 conference papers. She is an editorial board member of *Advances in Civil Engineering* and *Modern Civil and Structural Engineering*. She was a member of organizing and scientific committees of more than 30 conferences.

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