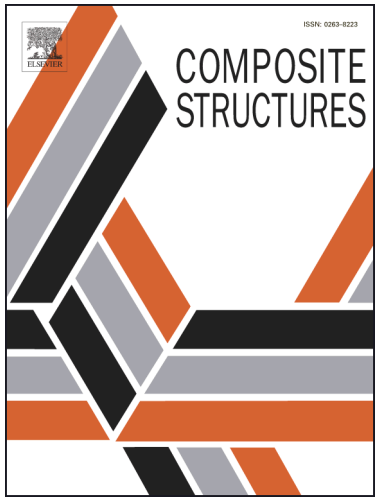

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CFRP-ECC HYBRID FOR STRENGTHENING OF THE CONCRETE STRUCTURES

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ABSTRACT: The strengthening of concrete structures using FRP composite and polymer adhesive has been challenged considering structural fire. This technology is limited to situations with low fire hazards. Though the cementitious adhesive showed improved fire resistance than the polymer counterpart, the former faces challenges of brittleness and high temperature spalling. This paper proposes a CFRP-ECC hybrid system for strengthening of the concrete structures. This hybrid consists of CFRP composite embedded in the ECC matrix. CFRP functions as the main load-carrying element, while ECC acts as the adhesive layer for protecting the CFRP and transferring the load between the concrete structure and CFRP. ECC is ductile in tension and has been shown to have improved fire performance without spalling over normal cementitious materials. In this paper, ECC was developed with a tensile strain capacity of 3%. Then direct pull-out tests were conducted to quantify the interface behavior between CFRP and ECC, and to obtain the effective bond length of CFRP. Finally a concrete beam with the CFRP-ECC hybrid strengthening was tested under four-point bending. The experimental results showed that the effective bond length of CFRP in ECC was longer than 170 mm. When the CFRP-ECC hybrid was used for strengthening of the concrete beam, premature debonding occurred at the interface