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Review

Fabric-reinforced cementitious matrix: A promising strengthening technique for concrete structures

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HIGHLIGHTS

- Previous studies on strengthening of RC structures with FRCM are critically reviewed.
- Factors affecting the performance of FRCM-strengthened RC elements are highlighted.
- Research gaps are identified.
- Directions for future research are outlined.

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ABSTRACT

Fabric-reinforced cementitious matrix (FRCM) systems have recently been introduced in the construction industry as a viable alternative strengthening material, to circumvent problems associated with fiber-reinforced polymers (FRP). They are made of fabric grids and a cementitious agent which serves as matrix and binder. The cementitious matrix used in FRCM systems has higher thermal capacity and better compatibility with the concrete substrate compared to those of the epoxy resin used in FRP. The use of FRCM composites for strengthening and repair of reinforced concrete structures, though relatively recent, is gradually gaining popularity as an alternative to FRP. This paper presents a critical review of existing research on structural strengthening with FRCM composites, identifies gaps in knowledge, and outlines directions for future research.

Contents

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1. Introduction

Since the early 1980's, fiber-reinforced polymer (FRP) composites have gradually gained popularity as viable strengthening materials for reinforced concrete (RC) structures. FRP composites possess certain characteristics, which make them a viable alternative to the traditionally used strengthening systems. These characteristics include corrosion resistance, high strength-to-weight ratio, and high versatility. FRPs consist of fibers embedded in a polymer matrix, usually epoxy resin. The epoxy resin used in FRPs is incompatible with the concrete substrate, resulting in a critical bond surface/line. This often leads to delamination of the composite from the substrate [1–8]. FRP composites also have poor performance at elevated temperatures and thermal incompatibility with the substrate. They are difficult to apply on humid surfaces and at low temperatures. Fabric-reinforced cementitious matrix (FRCM) systems, also referred to as textile-reinforced mortar (TRM), mineral-based composite (MBC) or textile-reinforced concrete (TRC) systems, have recently been introduced in the construction industry as an alternative to circumvent the problems associated with FRPs [9]. FRCM composites consist of fabric grids (made of fibers such as carbon, glass, etc.) and a cementitious agent (mortar)