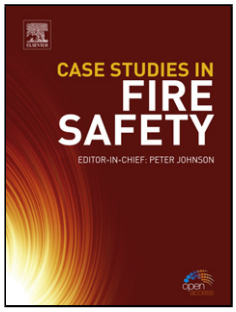

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Influence of matrix cracking and hybrid fiber reinforcement on the corrosion initiation and propagation behaviors of reinforced concrete

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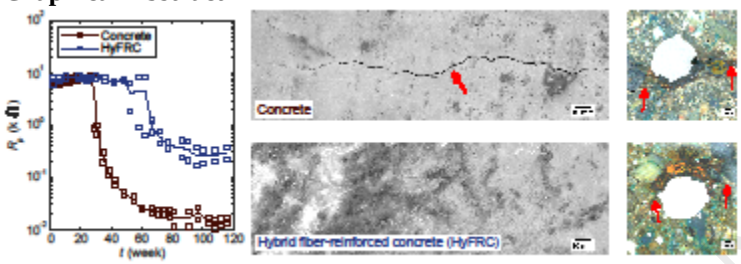
Graphical Abstract



HyFRC resists corrosion-induced cracks and lowers overall corrosion activity

Highlights:

- Corrosion activity in beam samples was monitored for 2.2 years.
- Corrosion initiation time highly correlated with flexural stiffness degradation.
- HyFRC restricted crack propagation and reduced total rebar mass loss.
- Corrosion products diffused into matrix further when cracks were restricted.
- Mechanical properties of HyFRC composites were less sensitive to corrosion damage.

Abstract:

While fiber-reinforced concrete has been proposed for corrosion damage control of reinforced concrete, long-term behavior of these composites remains largely uninvestigated. In this study, reinforced concrete and reinforced hybrid fiber-reinforced concrete (HyFRC) were subjected to a chloride environment for 2.2 years. Samples were mechanically loaded prior to chloride exposure to induce varied matrix cracking characteristics. When precracked, the time to corrosion initiation is correlated to flexural stiffness degradation. After corrosion initiation, fiber reinforcement restricts corrosion-induced cracking, causes more extensive diffusion of corrosion products into the cementitious matrix, and lowers overall mass loss of steel reinforcing bars. The mechanical responses of corroded samples are also reported.

Keywords: A. ceramic matrix composites; A. steel reinforced concrete; B. polarization; B. weight loss; C. alkaline corrosion; C. rust;

1 Introduction