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Effect of Steel Fibers on the Chloride Penetration Resistance of UHPC under Wet-Dry Cycling: Postprint

Authors: Li Cheng

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Abstract

Employing long-term chloride salt wet-dry cycling test methods, this study investigates the influence of different steel fiber volume fractions on chloride ion transport properties in UHPC and analyzes the time-dependent evolution of the apparent chloride diffusion coefficient and surface chloride concentration. The results indicate: (1) after 180 d of wet-dry cycling, a convection zone emerged at a depth of 2 mm in UHPC, and the internal chloride concentration profile conformed to Fick's second law; (2) steel fiber incorporation did not affect convection zone formation, the apparent diffusion coefficient of UHPC increased with steel fiber volume fraction during the early exposure period but gradually decreased with increasing curing age; (3) surface chloride concentration tended toward stability over time, and its development followed an exponential model.

Full Text

Preamble

Effect of Steel Fibers on Chloride Penetration Resistance of UHPC under Wetting-Drying Cycles

Li Cheng (China Railway 16th Bureau Group Road and Bridge Engineering Co., Ltd., Beijing 101500)

Abstract

This study employs a long-term chloride salt wetting-drying cycle testing method to investigate the influence of varying steel fiber volume fractions on the chloride transport properties of ultra-high performance concrete (UHPC), while analyzing the temporal evolution patterns of the apparent chloride diffusion coefficient and surface chloride concentration. The results indicate

that: (1) after 180 days of wetting-drying cycles, a convection zone emerges at a depth of 2 mm in UHPC, and the internal chloride concentration profile conforms to Fick's second law; (2) the incorporation of steel fibers does not affect the formation of the convection zone; during the early stages of exposure, the apparent diffusion coefficient of UHPC increases with higher steel fiber volume fractions but gradually decreases with increasing curing age; (3) the surface chloride concentration tends to stabilize over time, with its development following an exponential model.

Keywords: ultra-high performance concrete; steel fiber; chloride transport; apparent chloride diffusion coefficient

Note: Figure translations are in progress. See original paper for figures.

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