Accepted Manuscript

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PII: S0958-9465(18)30225-7

DOI: 10.1016/j.cemconcomp.2018.02.019

Reference: CECO 3009

To appear in: *Cement and Concrete Composites*

Received Date: 16 June 2016

Revised Date: 14 August 2017

Accepted Date: 6 February 2018

Please cite this article as: V. Dey, B. Mobasher, Quantitative characterization of accelerated aging in cement composites using flexural inverse analysis, *Cement and Concrete Composites* (2018), doi: 10.1016/j.cemconcomp.2018.02.019.

Quantitative Characterization of Accelerated Aging in Cement Composites using Flexural Inverse Analysis

Vikram Dey[1], Barzin Mobasher[2]

Abstract

A constitutive model consisting of a tri-linear tensile stress-strain with residual strength was applied in characterization and prediction of long term flexural behavior of several cement-based composite materials. Flexural test results were back-calculated to obtain material parameters and establish their relationship with aging. The material behavior is described by tensile stress-strain parameters consisting of elastic modulus, first cracking strain, post cracking stiffness, ultimate strain, and a residual strength parameter. The relationships between the material parameters and age were established by studying the time dependent flexural performance of various composites with glass and natural fibers as reported by Litherland et al. (1981), Marikunte et al. (1997), Bartos et al. (1996), and natural fibers reported by Toledo-Filho et al. (2000). An analytical model for prediction of rate and extent of damage as a function of time and temperature is proposed for degradation of flexural behavior of strain softening and hardening fiber reinforced concrete subjected to aging. This model is applicable to long-term durability of different classes of materials subject to accelerated aging under different environmental conditions.

Keywords: accelerated aging, durability, natural fibers, glass fibers, flexure, inverse analysis

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