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Carbon nanotube/cement composites for crack monitoring of concrete structures

Min-Ju Lim^a, Hyo Kyoung Lee^a, Il-Woo Nam^b, and Hyeong-Ki Kim^{a*}

^a School of Architecture, Chosun University,
309 Pilmun-daero, Dong-gu, Gwangju, 501-759, South Korea

^b College of Civil Engineering, Nanjing Tech University,
30 Puzhu Road(S), Nanjing, Jiangsu Province 211816, China

Abstract

The feasibility of using a carbon nanotube/cement composite as a crack sensor for concrete structures is evaluated. First, the relationship between the crack width and electrical conductivity of the composite material was investigated. Then, this analysis was repeated for the composite embedded in reinforced mortar beams, using three-point flexural loading. A conductivity model for the cracked composite was introduced and compared with experimental results. In addition, to evaluate whether monitoring was feasible under the conditions of crack closure by external loading, the cracked mortar beam was compressed along the vertical direction with respect to the crack and the conductivity of the composites embedded in the beam was measured. The conductivity of the composite decreased with increasing crack width and its reliability could be improved by increasing its original conductivity.

Keywords: Carbon nanotube (CNT); Cement composites; Electrical conductivity; Crack width, Crack sensor; Moisture content; Concrete structures

* Corresponding author. Tel.: +82 62 230 7143; fax: +82 62 230 7155. *E-mail address:* hyeongki@chosun.ac.kr

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