

Session 1: Concrete Fracture and Related NDT-1

Abstract-1



Keynote :
**Overview of Nondestructive Testing Techniques for the
Observation of Healing Effects in Cementitious Materials**

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The development of self-healing properties for cementitious materials gained some interest in the past. However, it is always challenging to determine the degree of healing and the healing efficiency in laboratory or field experiments. Most techniques reported in the literature are focusing on the evaluation of the regain in strength by means of destructive load tests. Nevertheless, this method ? although being straight forward and simple to be applied ? doesn't seem to be appropriate for a healing issue and does certainly not reflect the state of the art in non-destructive evaluation (NDE) techniques.

Non-destructive testing has the potential to evaluate fractures in concrete but also monitor the release of healing agents or the loss and regain of properties including gas or water tightness. Moreover, NDE methods can support the selection and right composition of suitable healing agents for individual applications. The methods that are candidates to be used for monitoring of self-healing (either at the laboratory or field scale) are ultrasound (in through-transmission and reflection), acoustic emission, infrared thermography (passive or active), microwave and RADAR techniques, resonance frequency and modal analysis measurements and several other techniques like CT scanning (for lab tests only), fiber optical or displacement field mapping techniques. Measurements of e.g. strain, crack opening, temperature, humidity, electric impedance for salt and moisture determination can be integrated in small wireless sensor networks for long-term monitoring of large structures.

In an EU project called HealCon (Self-healing concrete to create durable and sustainable concrete structures, <http://www.healcon.eu/>) the best candidates among the non-destructive testing methods are investigated to be applied in small and large laboratory experiments as well as at real structures in-situ. The paper is giving an overview about current techniques and addresses also issues of structural health monitoring used for example to monitor the healing effects on a long term basis and to assess the condition of the structure, where self-healing techniques are applied. The possibility to use NDE on self-healing concrete will be illustrated by first results.