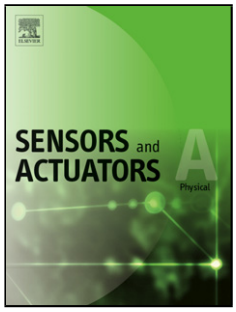

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PROGNOSIS OF FATIGUE AND IMPACT INDUCED DAMAGE IN CONCRETE USING EMBEDDED PIEZO-TRANSDUCERS

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RESEARCH HIGHLIGHTS

- Damage prognosis in plain concrete under fatigue and impact loading is performed.
- Piezo transducers embedded in concrete specimens are used as actuators and sensors.
- Electro-mechanical impedance (EMI) technique is used to study fatigue damages.
- Voltage time history along with EMI technique are used to study impact damages.
- Separate life prediction models are proposed for each of the loading scenarios.

ABSTRACT

Concrete structures are often subjected to a wide array of load conditions, such as fatigue and impact, and the consequent damages. Recently, smart materials, in particular the piezoelectric materials, have received high attention from the point of view of structural health monitoring (SHM). In this connection, the electro-mechanical impedance (EMI) is one of the latest and most effective techniques. The technique harnesses the piezoelectric property of lead-zirconate-titanate (PZT) patches to sense any incipient damage. In the research covered in the paper, embedded PZT patches are employed to monitor the accumulating damage in plain cement concrete subjected to fatigue and impact type loadings. Concrete specimens (150 mm cubes and 100φ×200 mm cylinders) of grade M-25 are cast with embedded concrete vibration sensors (CVS). The impact loading is simulated by a free falling iron-ball of mass 5 kg dropped from variable heights of 2 m,