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# Self-sensing piezoresistive cement composite loaded with carbon black particles

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## Abstract

Strain sensors can be embedded in civil engineering infrastructures to perform real-time service life monitoring. Here, the sensing capability of piezoresistive cement-based composites loaded with carbon black (CB) particles is investigated. Several composite mixtures, with a CB filler loading up to 10% of binder mass, were mechanically tested under cyclic **uniaxial compression**, registering variations in electrical resistance as a function of deformation. The results show a reversible piezoresistive behaviour and a quasi-linear relation between the fractional change in resistivity and the compressive strain, in particular for those compositions with higher amount of CB. Gage factors of 30 and 24 were found for compositions containing 7 and 10% of binder mass, respectively. These findings suggest that the CB-cement composites may be a promising active material to monitor compressive strain in civil infrastructures such as concrete bridges and roadways.

## 1. Introduction

Monitoring of civil engineering infrastructures has been a growing concern of the last few decades. As a result, a new discipline originated, structural health monitoring (SHM).

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