Embeddable piezoelectric sensors for strength gain monitoring of cementitious materials: the influence of coating materials

Yen-Fang Su,1 Guangshuai Han,1 Zhihao Kong,1 Tommy Nantung,2 and Na Lu1,3,4,*

1Lyles School of Civil Engineering, Sustainable Materials and Renewable Technology (SMART) Lab, Purdue University, 550 Stadium Mall Drive, West Lafayette, IN 47907-2051, USA.
2Office of Research and Development, Indiana Department of Transportation
3School of Materials Engineering, Purdue University, IN 47907-2051, USA.
4Center for Intelligent Infrastructure, Purdue University, IN 47907-2051, USA.

*: E-mail: luna@purdue.edu
Fig. S1 Schematic of polymer-coated sensor.

Fig. S2 LDV measuring system (a) Setup of LDV system, (b) Schematic of LDV measurement.
Fig. S3 EMI measuring system (a) Setup of EMI system, (b) Schematic of EMI measurement.

Fig. S4 PZT sensor with various coating thickness (a) 0.2 mm (without coating), (b) 0.5 mm (0.15 mm coating), (c) 1.0 mm (0.40 mm coating) and (d) 1.5 mm (0.65 mm coating).

Fig. S5 Meshing of PZT sensor, 0.5 mm in total thickness.
(a) 0.5 mm Polyester coated  
(b) 0.5 mm PDMS coated  
(c) 1.0 mm Polyester coated  
(d) 1.0 mm PDMS coated  
(e) 1.5 mm Polyester coated  
(f) 1.5 mm PDMS coated  

Fig. S6 FEM electric charge results of two types of polymer-coated PZT sensors with different coating thicknesses
Fig. S7 Conductance and susceptance spectrum of sample using embedded polyester sensor, embedded PDMS sensor, and surface-bonded uncoated sensor.