

Cement-Based Composites with Carbon Nanofillers for Smart Structural Health Monitoring Sensors

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Abstract : The progress of nanotechnology resulted in the development of new instruments in the field of civil engineering. In particular, the introduction of carbon nanofillers into construction materials can enhance their mechanical and electrical properties. In construction, concrete is among the most used materials. Due to the characteristics of its components and its structure, concrete is suitable for modification, at the nanometer level too. Moreover, to guarantee structural safety, it is desirable to achieve a widespread monitoring of structures. The ideal thing would be to realize structures able to identify their behavior modifications, states of incipient damage or conditions of possible risk for people. This paper presents a research work about novel cementitious composites with conductive carbon nanoinclusions able of monitoring their state of deformation, with particular attention to concrete. The self-sensing ability is achieved through the correlation between the variation of stress or strain and that of electrical resistance. Carbon nanofillers appear particularly suitable for such applications. Nanomodified concretes with different carbon nanofillers has been tested. The samples have been subjected to cyclic and dynamic loads. The experimental campaign shows the potentialities of this new type of sensors made of nanomodified concrete for diffuse Structural Health Monitoring.

Keywords : carbon nanofillers, cementitious nanocomposites, smart sensors, structural health monitoring.

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