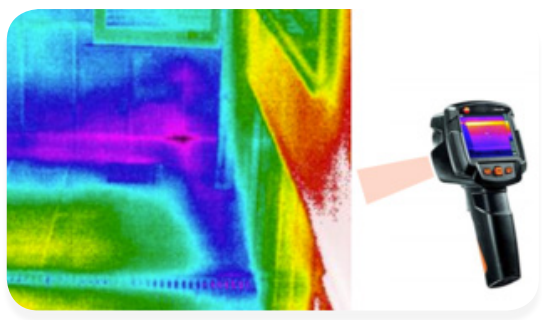
NON-DESTRUCTIVE TECHNIQUES TO MEASURE AND MONITOR THE DURABILITY OF CONCRETE

GIANMARCO REVEL - UNIVERSITÀ POLITECNICA DELLE MARCHE, ITALY – ENDURCRETE PROJECT

It is possible to use a wide selection of non-destructive techniques in order to evaluate the durability of a concrete structure:

- Electrical impedance measurement, exploiting the self- sensing properties of concrete
- Computer vision, to evaluate the presence of cracks
- Ultrasound techniques, to detect possible delamination defects
- Thermography, to evaluate the presence of humidity

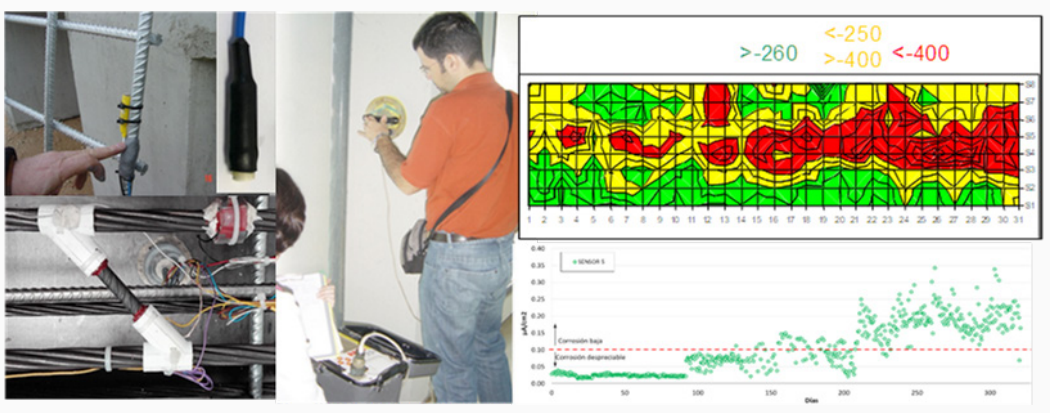


PREDICTIVE MONITORING SYSTEMS FOR REBAR CORROSION ASSESSMENT IN AGGRESSIVE ENVIRONMENTS

MARIA CRUZ ALONSO, CSIC, SPAIN, RESHEALIENCE/LORCENIS PROJECTS

Corrosion of reinforcements is the more common case for durability failure of concrete structures. The monitoring of performance in service of the concrete and the reinforcement can be followed through the use of non-destructive techniques. Sensors are recommended to employ. The sensors can be located on the surface for periodic monitoring or embedded, allowing remote monitoring and continuous data collection and transfer in a control unit for the data analysis.

Parameters of interest for corrosion performance at the concrete are pH changes, Chloride penetration increase, concrete resistivity and oxygen availability. For direct corrosion damage of the reinforcement electrochemical techniques are needed. The parameters more commonly analysed are: the corrosion potential, using electrodes located at the surface or embedded, and the corrosion rate determination through polarisation resistance method at measured at determined points at the rebar where the sensors are embedded or at several points along the surface of the concrete structure, allowing a mapping of performance of the whole structure.



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NOVEL CARBON BASED ADDITIONS FOR SELF SENSING CONCRETES

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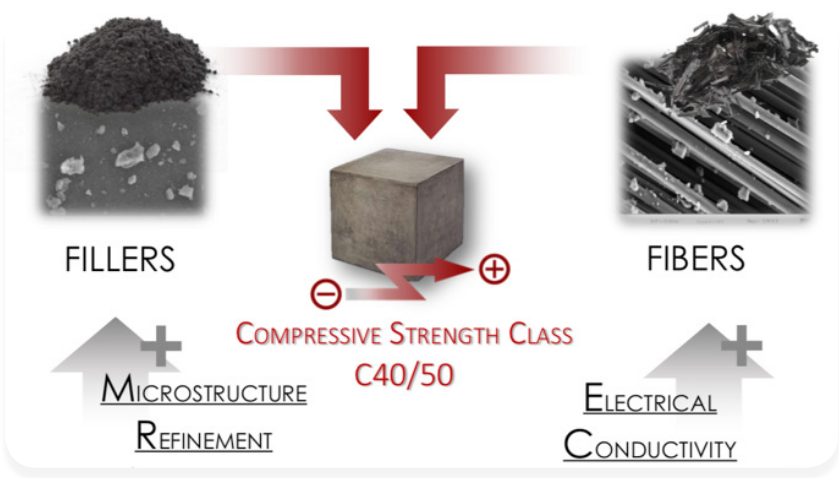
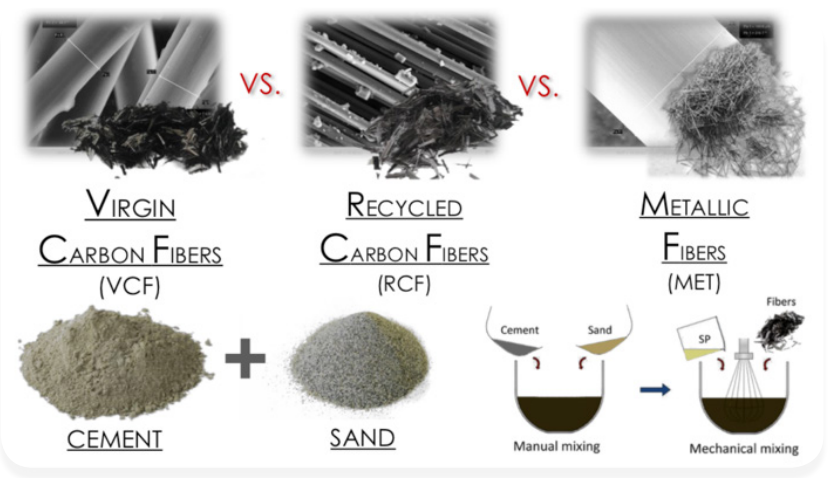
Concrete additions are defined as finely divided materials used in concrete in order to improve or to obtain desired fresh and hardened concrete properties. Carbon nanotubes, known for superb material properties are of great potential to be extensively dispersed into cement filling up the pores and modifying the structures at the Nano scale. Concrete is the most widely used construction material, and carbon nanofibers have many advantages in both mechanical and electrical properties such as high strength and high conductivity.

Self-sensing concrete refers to a structural material that can monitor itself without the need of embedded, attached or remote sensors. By measuring electrical resistance of the self-sensing concrete, the stress, strain, crack and damage can be in situ monitored. Compared with conventional structural materials which require additional sensors for monitoring or detection, the self-sensing concrete is advantageous in its high sensitivity, good mechanical property, natural compatibility, identical lifespan with concrete and easy installation and maintenance.





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