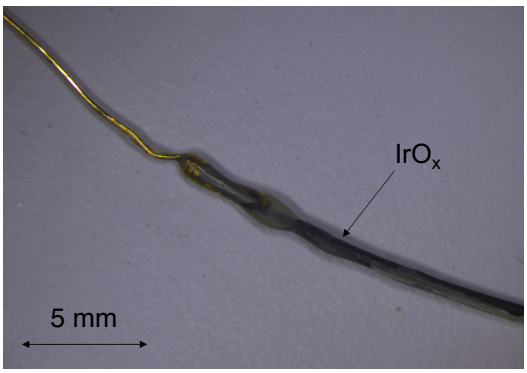
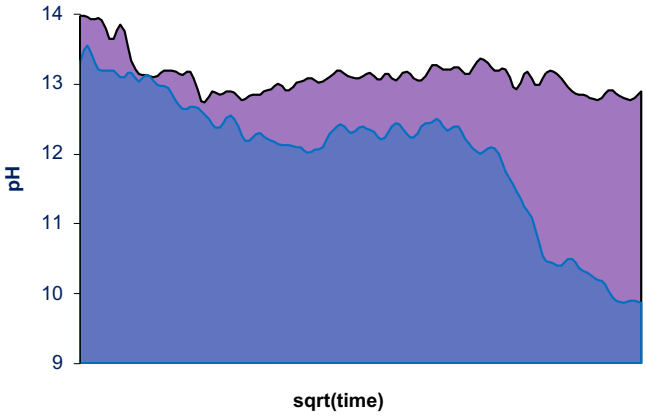
pH sensor

DuraMon





The Application

In the highly alkaline pore solution of concrete (pH 12.5-13.5), steel is protected from corrosion. However, carbonation leads to the reduction of the pore solution pH to levels lower than 9. In presence of oxygen and humidity, corrosion of the reinforcement occurs; this leads to loss of durability and ultimately structural deterioration. pH profiles monitoring is therefore of outermost importance for the estimation of the corrosion status in reinforced concrete.

The Challenge

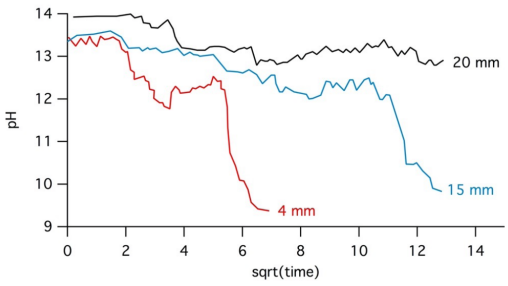
Most of the available methods to measure pH in concrete are destructive, time consuming, and do not allow pH monitoring.
Available embeddable pH sensors for concrete can be overall classified into 1) fiber optic sensors and 2) potentiometric sensors. Fiber optic sensors generally have short life spans and are unstable at high pH values typically found in non-carbonated concrete. The use of potentiometric sensors is limited due to the lack of a long-term stable reference electrode for concrete.

The Solution

Our proposed pH sensor (IrO_x sensor) is based on thermally oxidized iridium/iridium oxide electrodes. Our sensors permit measuring the pH in concrete with a maximum error of 0.5 pH units in a range of at least pH 9 to 13.5. From ongoing laboratory experiments, the sensors show a drift-free response for >3 years.
Our algorithm for evaluating the sensors responses allows overcoming the limitations generally associated with commercially available embeddable reference electrodes. Thus, our approach allows obtaining accurate and reliable data on the concrete pH.

Our offer

Our pH sensor is offered as a constituent part of our multisensor (compare “multisensor datasheet”). From our service on the sensors’ data analysis, we provide pH profiles at different cover depths over time.



The Implementation

Our sensor can be installed both in fresh and hardened concrete, thus new built structures and existing structures.

Specifications

- 0.5 mm diameter, 1-3 cm length.
- Long-term durable solution (>2 years in field conditions and ongoing).

Literature

- Y. Seguí Femenias et al. PH-monitoring in mortar with thermally-oxidized iridium electrodes," RILEM Tech. Lett., vol. 2, pp. 59-66, 2017.
- Y. Seguí Femenias, "Electrochemical durability monitoring in reinforced concrete," *PhD thesis.*
- Seguí Femenias et al. "Monitoring pH in corrosion engineering by means of thermally-produced iridium oxide electrodes," Mater. Corros., vol. 69, pp. 76-88, 2018.
- Y. Seguí Femenias et al. "Development of a novel methodology to assess the corrosion threshold in concrete based on simultaneous monitoring of pH and free chloride concentration," *Sensors,* vol. 18, no. 9, p. 3101, 2018.