Wireless monitoring of potentiometric sensor inside concrete structures

**Goal:** Development and evaluation of wireless technique for measuring chloride ions inside concrete structures.

**Project background:** This work is part of a project called “Integral solution for sustainable construction”, which is aimed to reliably model the service-life assessment of concrete structures.

**Description:** Potentiometric sensors have been used to measure the concentration of analytes in electrolyte. The potential of such sensor is correlated to the concentration of analyte via the Nernst equation. A Silver/silver chloride (Ag/AgCl) electrode is a chloride ion selective electrode. The potential of the Ag/AgCl electrode changes with the concentration of chloride ions. These chloride ion sensors are used in applications such as measurement inside concrete structures. In this application the sensor module is embedded inside concrete and the potential needs to be recorded wirelessly. Wireless monitoring of the sensor signal using electromagnetic coupling has been used previously to measure the half-cell potential of the Ag/AgCl electrode, see figure1a and b. Such communication protocol is passive. The principle of this wireless communication is the electromagnetic coupling between a secondary and primary coil. The changes in the resonance frequency of the secondary coil (sensor side) alters the resonance frequency of the primary coil (readout module) which will be monitored by an impedance analyzer. Another approach is the wireless monitoring through radio transmission. This is an active approach and is suitable for long distance communication.

Figure 1: (a)The schematic of passive wireless monitoring of the open circuit potential of an electrode using electromagnetic coupling. (b) Experimental setup for wireless monitoring of the chloride.

**Student task:** Study the wireless technique for monitoring of the half-cell potential of Ag/AgCl electrode.
Development of the wireless module. Experimental evaluation of the technique in aqueous solution and also in concrete blocks.

**Literature:**

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