Corrosion Monitoring of Reinforcing Steel in Mortar using Electrochemical Impedance Method

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**Background**
It currently has been passed over 50 years since many infrastructures constructed, and the deterioration in durability is a problem. Although it is well known that corrosion of reinforcing steel leads to concrete cracks, the mechanism is not clear yet. Therefore, an understanding for corrosion behavior of reinforcing steel is important in order to properly maintain the social infrastructures.

**Aim**
Wet and dry cyclic corrosion test of mortar specimen in which the corrosion sensors are embedded was conducted, and the corrosion rate was monitored. The aims are to show the usefulness of the corrosion sensor and to establish an efficient maintenance and management method by corrosion monitoring.

**Advanced Research Topics**
The mortar specimen was prepared by pouring the kneaded mortar (aggregate: water: cement = 3: 1: 0.6) after installing corrosion sensors of carbon steel to PVC jig at the different covering depth. The 24 hours-wet and 144 hours-dry cyclic corrosion test was conducted in the chamber set at 298K and 60% RH using 0.5M NaCl solution. During the corrosion test, corrosion rates were monitored by an electrochemical impedance measurement. The change in $Z_{10kHz}$ of the corrosion sensor showed that the corrosion sensor surface with low covering depth got wet faster. In addition, the results of corrosion rate showed the same tendency, and the surface appearance after the corrosion test also agreed with these results.

**Publications**
- Katayama, Yamada, Hoshi, Shitanda, Itagaki: Proc. of the Concrete Structure Scenarios, JSMS, Vol. 18 (submitted)

**Summary**
- Corrosion monitoring by electrochemical impedance method using corrosion sensors are very useful.
- The corrosive environment in the mortar depends on the covering depth, and the corrosion rate of reinforcing bars increase with an decrease of covering depth.

**Research outcome**
- Advancement of sensing technology
- Corrosion monitoring in actual environment
- Corrosion life prediction based on corrosion mechanism