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Evaluation of the Performance of MCI-2005NS in Customers Water (Part One)

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Project #:11-222-1425(bis)

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Background: Customer asked if MCI-2005NS will protect embedded reinforcement in concrete that is exposed to corrosive elements including water with high chloride and sulfate concentrations.

Purpose: To evaluate the corrosion protection provided by MCI-2005NS in water prepared according customer requirements.

Sample Received: N/A

Sample(s) labeled: N/A

Method:

Immersion corrosion test.

Materials:

MCI-2005NS, batch 10391
Sodium Chloride, lab grade
Sodium Sulfate, lab grade
Calcium Hydroxide, lab grade
Electrochemistry test kit
Working electrode made from steel SAE 1010
Panels (Carbon Teel SAE 1010)
Methanol, lab grade

Procedure:

1. Several electrolyte samples were prepared. All samples contained 23.4 g/l Cl^- and 4.3 g/l SO_4^{-2}.
    a. Control – a neutral pH solution containing 23.4 g/l Cl^- and 4.3 g/l SO_4^{-2}.
    b. Control + 0.8% MCI-2005NS – same as control sample above, but also containing 0.8% MCI-2005NS by weight. This correlates to our recommended dosage rate of 1 liter/m^3.
    c. SPS – a high pH solution designed to simulate a concrete environment. Electrolyte was the same as control sample above with the addition of 0.25% $Ca(OH)_2$ (Simulated Porous Solution – SPS).
    d. SPS + MCI-2005NS – same as SPS above, but with the addition of 0.8% MCI-2005NS by weight. This correlates to our recommended dosage rate of 1 liter/m^3.
2. Carbon steel panels were cleaned with methanol, air dried and weighed.
3. Immersion testing in the above prepared electrolyte solutions was performed. The prepared carbon steel panels were immersed in the electrolyte solutions for a period of 2 weeks.
4. After two weeks, the panels were removed from the solution and photographed as seen in the photo below. They were then cleaned, air dried and weighed. Weight loss of the panels was determined and percent of corrosion protection calculated.

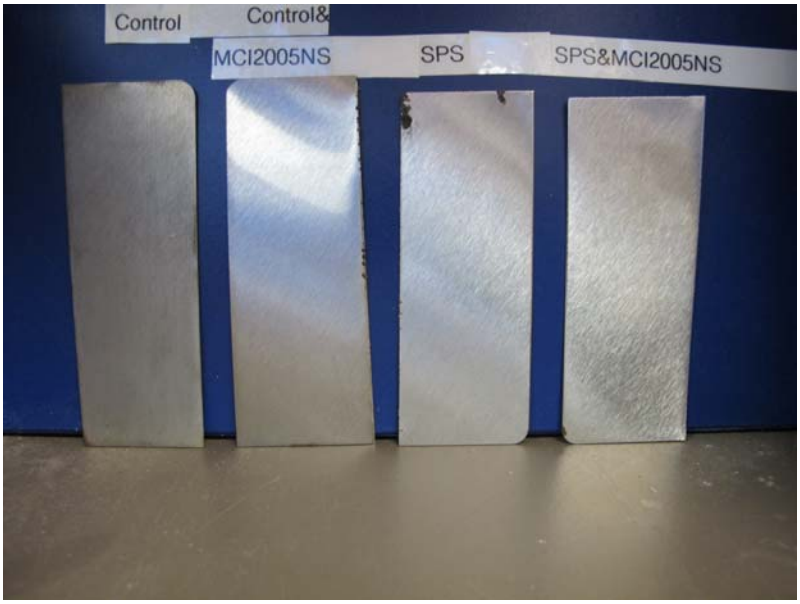
Results:

Table 1 Immersion Corrosion Test

Material	Initial weight, g	Final weight, g	Weight loss, g	Corrosion Protection, Z* %
Control	24.729	24.603	0.126	-
Control + 0.8% MCI-2005NS	25.136	25.119	0.017	86.5 (*)
SPS	23.707	23.6597	0.049	-
SPS + 0.8% MCI-2005NS	24.042	24.030	0.012	74.6 (**)

(*) As compared to control. (**) As compared to SPS sample.

Photos:



Interpretations:

1. According to the test results MCI-2005NS provides excellent corrosion protection to carbon steel exposed to chlorides and sulfates.
    a. High pH environments lower the corrosion rate of steel as can be seen when comparing the control (neutral pH) with the SPS (high pH) sample.
    b. This explains why the percent protection looks like a smaller difference between the SPS and SPS + 0.8% MCI 2005 NS samples than between the Control and Control + 0.8% MCI 2005 NS samples.
2. MCI-2005NS lowers the localized corrosion in Chloride/Sulfate containing electrolyte used in this tests.

Testing on concrete blocks is in progress.