Migrating Corrosion Inhibitors

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ABSTRACT

Application of migrating corrosion inhibitors has been proven as an effective method to remedy contaminated concrete from further corrosion. Two case studies using organic corrosion inhibitors to preserve existing concrete structures are analyzed. The first case examine is preservation of an old railway viaduct in Tokyo. Electrochemical inhibitor injection (EII) was used to penetrate the concrete cover and reach the rebar region with adequate concentration, which was proven effective. This method involves application of aqueous solutions of organic base corrosion inhibitors onto the concrete surface with controlled current densities passed between anodes placed within the inhibitor solutions and the embedded steel bars acting as cathodes. A strong electric field is needed for the successful migration of inhibitor ions. The corrosion rate increased significantly in the first two weeks after treatment and recovered to normal level after 6 months. The high humidity area where the reference electrode was placed might be the main cause of the misrepresentative value. The second case was preservation of a harbor in the Atlantic Ocean. The organic inhibitors were applied on the surface after a recent repair patch. The test result also proved the efficiency of surface-applied corrosion inhibitors in the first stage. However, the rebound of corrosion after 8 years indicates the anti-corrosion effect of inhibitors is not permanent, especially when exposed to a very aggressive environment. Continued monitoring is needed for such projects to clarify the reduction rate of inhibitor efficiency and decide the timing of reapplication. For further research, it would be helpful to understand the relationships between the concentration of inhibitor in the electrolyte solutions applied on the surface and the magnitude and durations of the specific electric field, which will be a good guideline for future practical application of EII to preserve deteriorated concrete structures. In addition, a widely accepted criterion to determine the completion of a successful migrating corrosion inhibitor treatment which can be achieved at a reasonable cost also needs to be established.

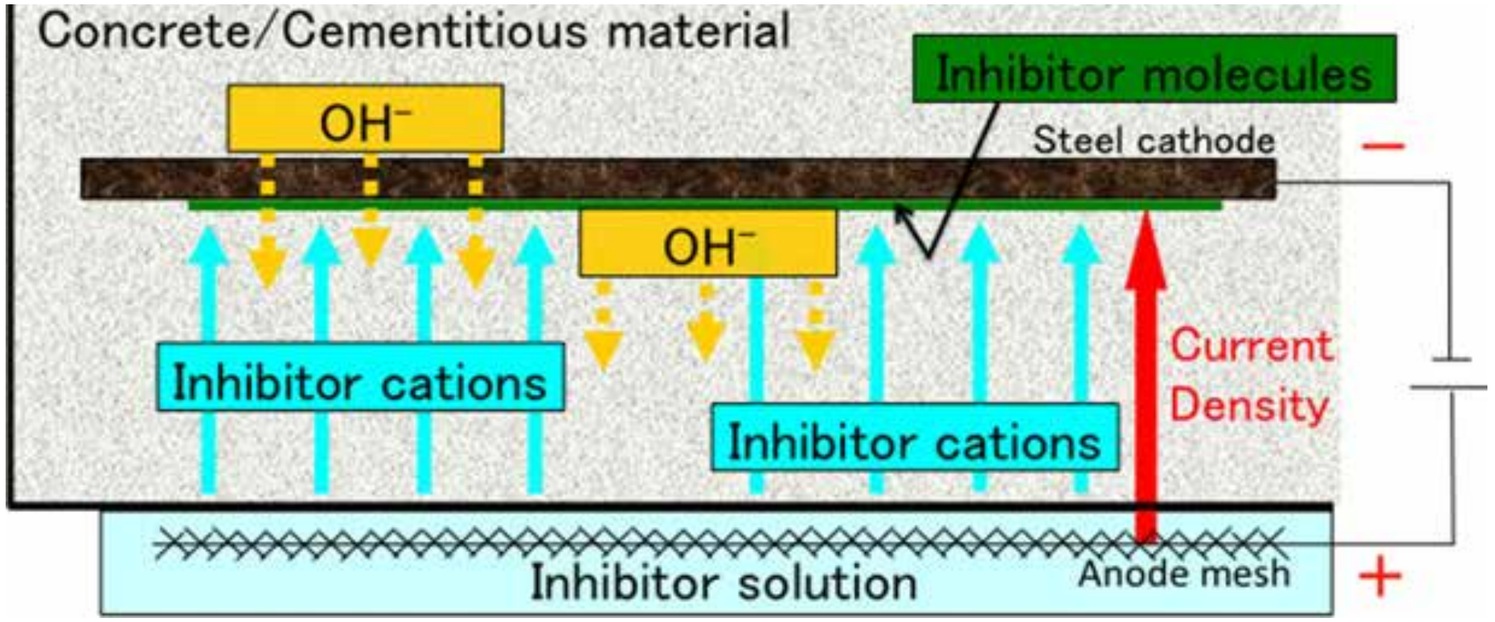

Figure 1. Kubo, Junichiro, Yuji Tanaka, Christopher L. Page, and Mary M. Page. “Application of electrochemical organic corrosion inhibitor injection to a carbonated reinforced concrete railway viaduct.” Construction and Building Materials 39 (2013): 3

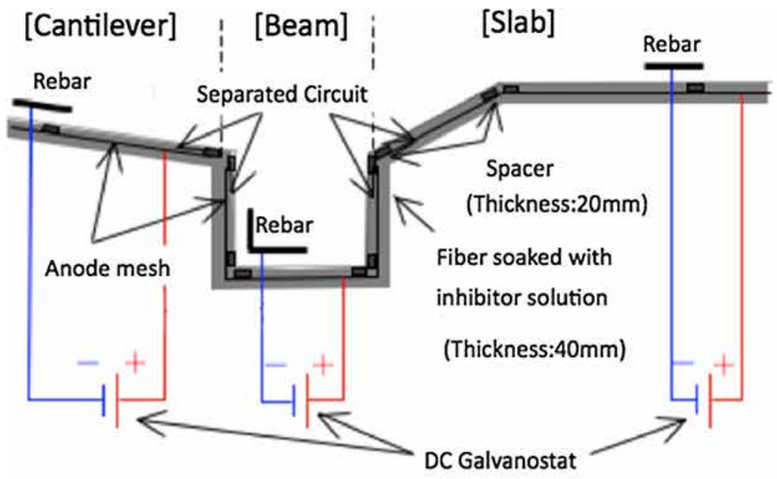

Figure 2. Kubo, Junichiro, Yuji Tanaka, Christopher L. Page, and Mary M. Page. “Application of electrochemical organic corrosion inhibitor injection to a carbonated reinforced concrete railway viaduct.” Construction and Building Materials 39 (2013): 4.

Figure 3. Martínez, Isabel, and Ángel Castillo. “Concrete surface applied corrosion inhibitors: on site evaluation by non-destructive electrochemical techniques.” (2020).P.5