Corrosion Protection of Water Pipe Materials by Addition of Trace Amounts of $Ca(OH)_2$ in Simulated Seawater Environment

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Date: 27 April, 2023 (Thursday)
Time: 10:00 a.m.
Venue: Room 7-34, Haking Wong Building, HKU

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Abstract:

Metal corrosion is always a serious problem and leads to hundreds of billion of dollar loss annually. The corrosion of steel pipe under seawater environment is a topic under the spotlight in this field, given that the wide use of steel as pipelines in seawater or as a carrier of seawater and a more corrosive environment due to the various ions exist in seawater, especially for Chloride ion (Cl^-). The major cathodic reaction in seawater that leads to the dissolution of steel is $2e^- + H_2O + \frac{1}{2}O_2 \rightarrow 2OH^-$. Theoretically, addition of Hydroxide ion (OH^-) can slow down steel corrosion by compression of the cathodic reaction, raise of pH value, and competition between Cl^- and OH^- on steel surface absorption. This makes addition of Calcium Hydroxide ($Ca(OH)_2$), a relatively economical and environmental-friendly material, a good candidate for corrosion protection of steel in the seawater environment. In stead of high concentration of $Ca(OH)_2$, which is widely researched for reinforced concrete environment, our research focuses on the its influence on corrosion at the addition of a trace amount, about tens of micrograms per liter.

To justify these predictions, we conducted weight-loss measurements to inspect the corrosion rate for steel under simulated seawater environment without and with the addition of trace amounts of $Ca(OH)_2$. A series of electrochemical tests, including open circuit potential measurement (OCP), electrochemical impedance spectroscopy (EIS), and linear polarization test (LPR), were carried out in order to theoretically predict the corrosion rate and analyze the corrosion mechanism. We will also examine corrosion products formed in experiments to observe the chemical composition of corrosion product layer for providing support to those theoretical predictions and analysis.

ALL INTERESTED ARE WELCOME

For further information, please contact Prof. AHW Ngan at 3917 7900.