Long Term Evaluation of Corrosion of Carbon Steel Using Electrical Resistivity in Sodium Chloride Environment

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Abstract: In this paper, the corrosion characteristics of mild steel A1018M immersed in 3 % of sodium chloride solution under room temperature and condition was investigated. Corrosion rate of the specimen decreased with its exposure time to sodium chloride solution increased.

1. Introduction: Corrosion of metals is one of the oldest problems that have ever challenged the industrial world and is defined differently based on their application. Corrosion is the gradual physiochemical destruction of materials by the action of environment. Corrosion of the metal will result in degrading many other material properties. Stainless steel is widely used for potable water storage purposes beside other metals. The extent and cost of damage caused by leakage in storage containers has been rising during recent years. The use of stainless steel in oil & gas transportation, potable water storages, heat exchangers and steam turbines is now common. Dissolved salts and oxygen mainly determine corrosive behavior of metals in aqueous solutions. In order to minimize corrosion problem, it is important to identify the mechanism of corrosion rate of ions with stainless steel, the extent to which they contribute to corrosion of stainless steel (Essam and Hussein, 2005).

2. Objective: The objective was to quantify the steel corrosion in saline solution with time. Also investigate the physical and electrical changes in the metal and corroding solution.

3. Materials and method: As testing specimen, ASTM 1018M plate samples with average dimension of about 50 mm×26 mm×5.1 mm were used for this experiment. Specimen was placed in suspended position in 3 % of sodium chloride solution without exposed to air.

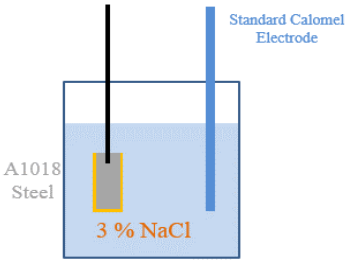
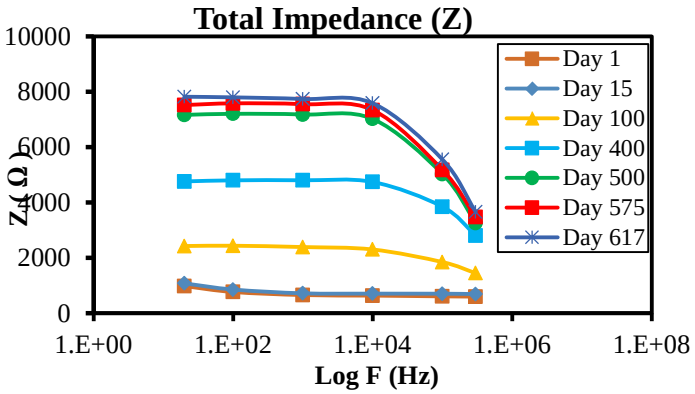
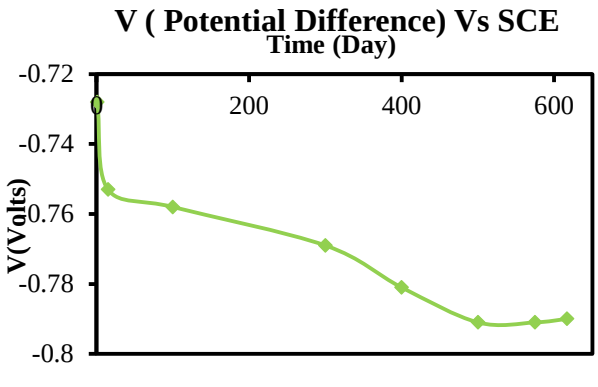


Figure 1. Schematic representation of the corrosion cell

4. Results and Analyses:





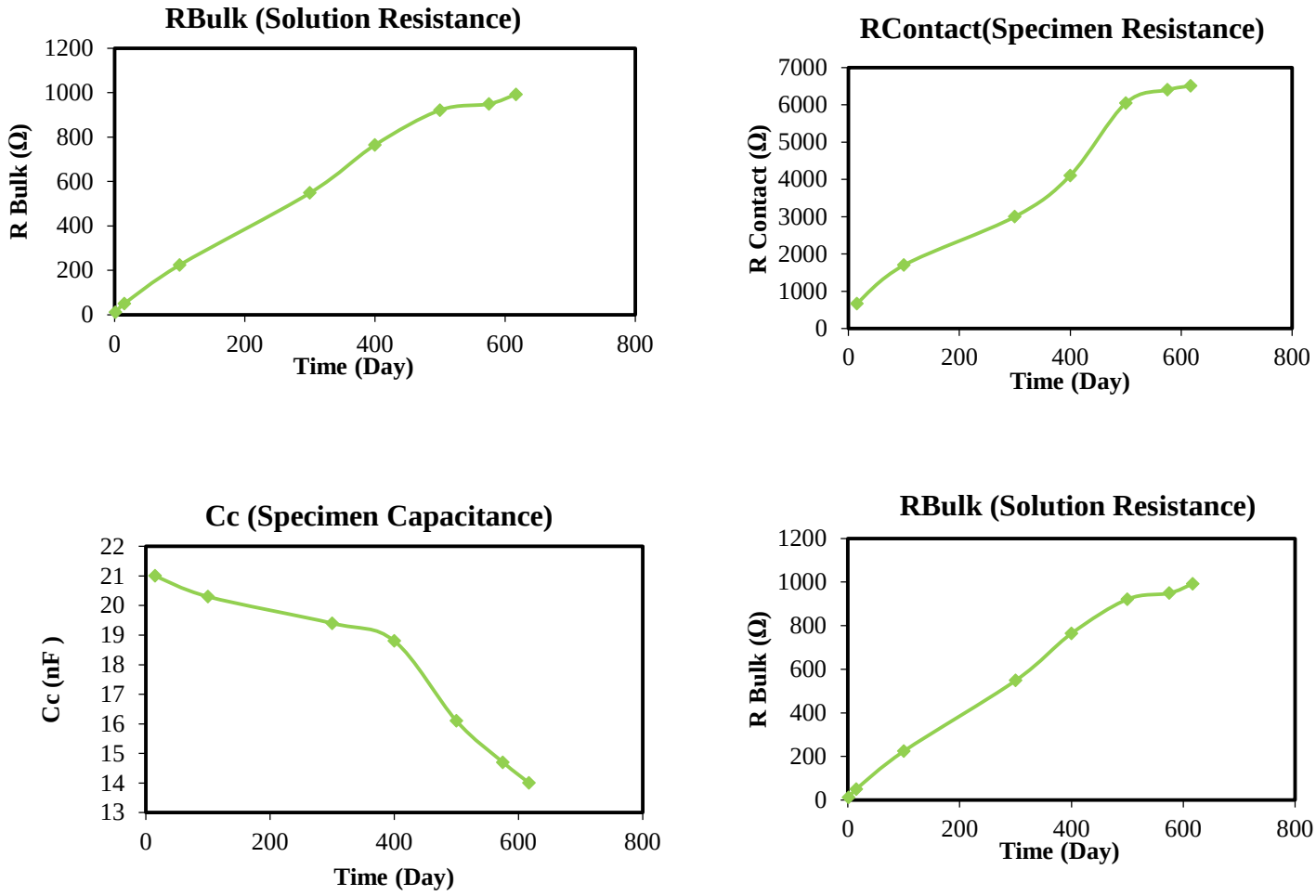


Figure 2. Total impedance, Potential, Bulk Resistance, Contact resistance Contact capacitance and $R_C C_C$ of the steel specimen during the corrosion process

5. Conclusion:

The corrosion of A1018M steel was studied under sodium chloride solution. Corrosion of the mild steel increased with time of exposure and also electrical properties of the steel was evaluated throughout the corrosion process.

6. Acknowledgment

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7. References

1.Essam Hussein and Hussein A., (2005), Erosion – Corrosion of Duplex Stainless Steel Under Kuwait Marine Condition, Desalination, Volume 183, Issues 1–3, 1 ,November 2005, Pages 227–234, doi:10.1016/j.desal.2005.02.051.