Studying the Corrosion Behavior of Plain-Carbon Steels in Water Environments

Dr. Khalid Othman Sharaf*

Abstract

The corrosion behaviour of plain-carbon steels in water environments has been studied. In this study, a wide range of carbon steels are used in the most common corrosion environments which are salt water and drinking water. The specimens were immersed in the water media for (30, 45 and 60) days and corrosion rates evaluated, using the weight loss method. The effect of carbon content, corrosion environments and time of immersing on the specimens corrosion rates of Hypo-eutectoid plain carbon steels have been studied. The aim of this work is to study the effect of carbon content on the corrosion rate of carbon steels in different corrosion media and various time intervals. The obtained results showed that there is a clear correlation with the microstructure where higher Pearlite show higher corrosion rate, so the corrosion rate increases with the carbon content. The results also show that the corrosion rate of carbon-steel in salt water is higher than its value in drinking water. It is also found that longer exposure time, leads to a lower corrosion rate while weight loss is still increasing

Keywords: Plain-carbon steels, Carbon content, Water environments, Corrosion processes.

For the abstract in Arabic see pages (381-396).

*Damascus University, Faculty of mechanical and electrical Eng. Damascus, Syria.

References

- ASM Handbook Volume13A: Corrosion: Fundamentals, Testing, and Protection ASM International, 2003.
- Mars G. Fontana, "Corrosion Engineering" Third Edition, 2006.
- NCS Schools Experiments Corrosion and Protection of Metals, Article given on the internet at the web site http://www.npl.co.uk/.(2005).
- K.R. Trethewey & J. Chaberlain, "Corrosion for Science and Engineering" 2nd ed., printed in Singapore, 1996.
- Pierre R. Roberge, Handbook of Corrosion Engineering, 1999.
- Stephen C. D. , "Galvanic Corrosion", University of Delaware, U. S. A. , 2003.
- L. L. Shreir, R. A. Jarman and G.T. Burstein, "Corrosion Control", Third Edition, Vol.2, 2000.
- William D. Callister, JR. Materials Science and Engineering an Introduction. Seventh edition, USA-2007.
- Raja V. S., Baligidad R. G.,and Shankar Rao V., "Effect of Carbon on Corrosion Behavior of Fe3 Al Inter-metallic's in 0.5 N Sulfuric acid ", Journal of Corrosion Science, Vol. 33, pp.521–533, 2002.
- Batis G., and Rakanta E"Corrosion of Steel Reinforcement Due to Atmospheric Pollution" ,Journal of Cement and Concrete Composite, Vol. 27, pp. 269 – 275, 2005.
- Takasaki S., and Yamada Y., "Effects of Temperature and Aggressive Anions on Corrosion of Carbon Steel in Potable Water", Journal of Corrosion Science, Vol. 49, pp. 240-247, 2007.
- Wall F. D., Martinez M. A., and Missert N. A., "Characterizing Corrosion Behavior Under Atmospheric Conditions Using Electrochemical Techniques", Journal of Corrosion Science, Vol. 47, pp. 17-32,2005.
- Corvo F., and Minotas J., "Changes in Atmospheric Corrosion Rate Caused by Chloric Ions Depending on Rain Regime", Journal of Corrosion Science, Vol.47, pp. 883 – 892, 2005.
- Garcia K.E. and etal H., "Lost Iron and Iron Converted in to Rust in Steels Submitted to Dry-Wet Corrosion Process", Journal of Corrosion Science, Vol. 50, pp. 763-772, 2008.
- Mik Corite, Heat Treatment of Steel. 2004. Internet.
- Brooks, C. R., Principles of the Heat Treatment of Plain Carbon and Low Alloy Steels, ASM International, Materials Park, OH, 1995.