

Study of the variational patterns for corrosion kinetics of carbon steel as a function of dissolved oxygen and NaCl concentration

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The simultaneous occurrences of electrochemical reactions responsible for corrosion of carbon steel in NaCl solutions have been analyzed on the basis of the mixed potential theory in order to determine the combined effect of dissolved oxygen and NaCl concentration on corrosion potential, corrosion current density and hydrogen evolution. This was achieved through the estimation of the functional dependence from both, the dissolved oxygen and the NaCl concentration for each of the kinetic parameters involved in the corrosion process. The main finding is the existence of the critical dissolved oxygen value at which a notorious change in variational pattern for corrosion potential, corrosion current density and hydrogen evolution is observed. The validity of this feature is supported from experimental evidence reported in previous investigations. In this context the role of pitting corrosion, oxide film and diffusional effects are discussed. © 2009 Elsevier Ltd. All rights reserved.