Passivation and Corrosion Behavior of P355 Carbon Steel in Simulated Concrete Pore Solution at pH 12.5 to 14

Baosong Li¹*, Yuxing Huan¹, Weiwei Zhang²

¹ College of Mechanics and Materials, Hohai University, Nanjing 211100, China
² College of Mechanical and Electrical Engineering, Hohai University, Changzhou 213022, China
*E-mail: bsli@hhu.edu.cn

doi: 10.20964/2017.11.51

Received: 20 July 2017 / Accepted: 6 September 2017 / Published: 12 October 2017

The passivation by potentiostatic polarization and electrochemical behavior of P355 carbon steel in saturated Ca(OH)₂ solution (SCS) at pH 12.5 to 14 were investigated. The effects of polarization potential, pH, polarization time on the behavior of P355 carbon steel were evaluated. The results illustrated that the P355 carbon steel exhibits well passive behavior with a broad passive region. The time for polarization current to reach a steady state will be prolonged with the increase of pH and the decrease of polarization potential. The passive film displays the behavior of n-type semiconducting. The optimal passivation potential is 300 mV positive and 100 mV negative to the passive film E_corr, which is usually in the range of -100 mV to -600 mV. The threshold value of the chloride ions is 0.1 M. More than 0.5 M chloride ions will lead to the passivity breakdown and initiate serious corrosion.

Keywords: passivation; electrochemical impedance spectroscopy; corrosion; saturated Ca(OH)₂ solution; carbon steel

© 2017 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).