Enhancing Corrosion Resistance of Galvanized Steel by Phosphating and Silicate Post – Sealing

Soha A. Abdel-Gawad^{1*}, Mervat A. Sadik², Madiha A. Shoeib³

¹ Chemistry department, Faculty of Science, Cairo University, Egypt

² October High Institute for Engineering and Technology

³ Corrosion Control & Surface Protection Department, Central Metallurgical Research and Development Institute, CMRDI, Cairo, Egypt

*E-mail: Soha.gawad@yahoo.com

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Hot dip galvanized (HDG) coatings are widely used in various industrial fields for better corrosion protection of steels. Comparative study of the corrosion behavior of the phosphated hot-dip galvanized steel conversion coatings and post-sealing in sodium silicate solution were characterized in 3.5 % NaCl solution by different techniques, electrochemical impedance spectroscopy (EIS) and potentiodynamic polarization. The surface morphology and elemental composition of hot-dip galvanized steel and post treated were characterized by scanning electron microscope (SEM) and energy dispersive X-ray spectroscopy (EDX). The results showed that after phosphating the porous phosphate crystals formed on the surface of HDG steel and the phosphating followed by post-sealing samples in sodium silicate solution filled into the phosphate pores. The optimum silicate concentration ranged from (3-5 g/l), its morphology has fine crystal, compacted and dense uniform coating (zinc-silicate complex). Low silicate concentration (3-5 g/l) have better protection property and best corrosion performance than other high concentration (7-10 g/l) due to cracks formation in coating and bad protection.

Keywords: Hot-dip galvanizing steel process; phosphate conversion coatings; post-sealing silicate; corrosion resistance; potentiodynamic polarization; electrochemical impedance spectroscopy

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