

Article

Hydrophobic and corrosion resistant composite hot-dip zinc coating for protection of steel

C. V. Geethanjali *, A. H. Riyas and M. J. Deepa

Department of Chemistry, University of Kerala, Kariavattom Campus, Thiruvananthapuram, Kerala - 695 581, India; geethanjaliidkv@gmail.com

* Correspondence: geethanjaliidkv@gmail.com; Tel.: +91 8301027866 (Mob)

Abstract: Hot-dip galvanization is the most widely used method for the protection of steel against corrosion. The strategy of introducing hydrophobic nature to the hot-dip zinc coatings along with the corrosion resistance characteristics can enhance the protective efficacy and life time of the coatings. The effective enhancement in corrosion resistance and hydrophobic characteristics of hot-dip zinc coating can be achieved by incorporating metal oxide based composite into the coating matrix. In this contest, the present work explores the effect of introducing $\text{TiO}_2\text{-Al}_2\text{O}_3$ composite into hot-dip zinc coating for improving the hydrophobic and corrosion resistant characteristics of the coatings. The structural modification of the inner alloy layers of the hot-dip coating by using 0.2 wt.% of $\text{TiO}_2\text{-Al}_2\text{O}_3$ composite improves the hydrophobicity and corrosion resistance of the coating. Surface morphology, surface topography, chemical composition, hydrophobicity and electrochemical performance of the composite coatings studied by using various instrumental analyses confirm the enhancement in coating characteristics due to the incorporation of $\text{TiO}_2\text{-Al}_2\text{O}_3$ composite into the zinc matrix. The composite zinc coating incorporated with optimized $\text{TiO}_2\text{-Al}_2\text{O}_3$ exhibits enhanced hydrophobicity with a water contact angle of 101.32° than the pure zinc coatings. The high E_{corr} (-1267.17 mV) and low i_{corr} (475.57 $\mu\text{A}/\text{cm}^2$) values of the composite coating as compared to the conventional zinc coating implies the improvement in corrosion resistance.

Keywords: Hot dip galvanization; $\text{TiO}_2\text{-Al}_2\text{O}_3$; hydrophobicity; corrosion resistance
