

Hot Dip Galvanizing Simulation of Interstitial Free Steel by Liquid Zinc Spin Coater: Influence of Dew Point on Surface Chemistry and Wettability

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In order to establish the relationship between surface chemistry and wettability as a function of dew point, an attempt has been made to simulate the hot-dip galvanizing process with an 'in-house' built Liquid Zinc Spin Coater. Interstitial free (IF) steel was annealed at 820°C in N₂-5%H₂ gas atmospheres with dew points of -79°C, -29°C and 0°C, respectively. The wettability tests were conducted at 470°C at low dew point of 79°C. Surface analyses prior to wetting were carried out by using X-ray photoelectron spectroscopy (XPS) and Field Emission Scanning Electron Microscopy (FE-SEM). As expected, external oxidation of Al was observed only at the low dew point. With increasing dew point the oxidation of Cr and Si becomes internal. The formation of manganese silicates was observed at all dew points. While sulphur was detected on the specimen surface after all annealing conditions, the segregation of P starts to be significant at dew point 0°C by forming Mn-phosphates. Despite the surface oxides, specimens annealed at all dew points are in the wetting regime by liquid zinc. Investigations on the steel/zinc interface of IF steel by using the liquid zinc spin coater were successful.

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