A Study of Microstructure and Electrochemical Corrosion Behavior of Coatings with Different Aluminum and Magnesium Contents

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Abstract： Based on the relevant literature, this paper uses a simulator to experimentally produce two types of zinc coatings in the laboratory: Zn-20%Al-5%Mg and Zn-15%Al-6%Mg. Compared with the commercially mature products Zn-11%Al-3%Mg and Zn-6%Al-3%Mg, Zn-20%Al-5%Mg and Zn-15%Al-6%Mg coatings are analyzed. This paper employs Scanning Electron Microscopy (SEM) and electrochemical corrosion to analyze the microstructure and corrosion resistance of the four types of Zn-Al-Mg coatings. The results show that complete dendritic crystals are formed on the surface of the hot-dip Zn-Al-Mg coating, while there are no complete dendritic crystal structures in the cross-section of the coating. As the content of Al in the bath increases, the content of Zn dissolved in the Al phase gradually decreases. The mass percentages of Al and Zn on the Al dendrite formed in the four types of coating's surface, Zn-20%Al-5%Mg, Zn-15%Al-6%Mg, Zn-11%Al-3%Mg, and Zn-6%Al-3%Mg, they are 105%, 96.5%, 37.5%, and 22.7%, respectively. Due to the high content of Al and Mg elements in the Zn-20%Al-5%Mg coating, on the coating's surface, the electrochemical corrosion products are a dense and insoluble film which can effectively inhibit the further occurrence of corrosion. Comparing the corrosion currents of the four coatings, the Zn-20%Al-5%Mg exhibits the best corrosion resistance.

Keywords： Zn-20%Al-5%Mg； The coating； Microstructure； Electrochemical corrosion；Aluminum dendrite；

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