The Development of High Corrosion Resistant Zn/Zn-PP Composite Coating

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This study aims to develop composite coatings of Zn inner layer and Zn-PP outer layer, utilizing PP waste, on low carbon steel by using electroplating and simple spray methods, respectively for Cd replacement. Zn-PP coatings were prepared by mixing the appropriate amount of epoxy binder, Zn, and PP powders. Four varying Zn-PP compositions as 1Zn-0PP, 0.6Zn-0.4PP, 0.4Zn-0.6PP, and 0Zn-1PP were prepared. Their corrosion resistances in marine atmosphere (3.5% NaCl) were investigated for up to 336 h and compared to that of Cd and Zn electroplating, and epoxy coating. The coating structures before and after corrosion test were characterized using XRD, optical microscope, SEM-EDX. The results show that Zn-PP coatings before corrosion test have uniform and compact structure. The Zn and PP particles well dispersed with epoxy on the substrate. According to the corrosion kinetic curve and characterization results, Zn electroplating experiences high corrosion rate and severely corroded by forming Zn5(OH)8Cl2H2O and ZnO. Otherwise, Zn-PP coating exhibits low corrosion rate. The coatings can act as a barrier to the aggressive element of corrodents and improve Zn corrosion resistance significantly. No pitting corrosion is formed on Zn/Zn-PP coated samples. In comparison to epoxy coating, the presence of Zn-PP fillers can inhibit the epoxy coating corrosion damage and improve its microhardness. Moreover, the obtained results indicate that Zn/0Zn-1PP exhibits the highest corrosion resistance to the marine atmosphere. This strongly suggests that PP waste powder can be used as coating material to improve Zn corrosion resistance. Keywords: Zn, Zn/PP, composite coating, corrosion, NaCl.