

Deposition and Corrosion Resistance of Electrophoretic Paint Coated on AZ61 and TZ61 Magnesium Alloys

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Abstract: Electrophoretic paint (E-paint) was investigated on four different magnesium substrates: as-extruded AZ61 (AZ61), heat-treated AZ61 (AZ61-H), as-extruded TZ61 (TZ61) and heat-treated TZ61 (TZ61-H), to elucidate the effect of heat treatment and alloying elements on the deposition and corrosion resistance of E-paint. It was found that, a rapid increase of voltage, indicating that the deposition of E-paint had started, was observed after an induction time of 0.39 min for AZ61-H, 0.43 min for AZ61, 0.51 min for TZ61-H and 0.58 min for TZ61. The amount of E-paint deposited on the four samples was approximately similar, but the electrical charge used for the deposition process on the heat-treated samples was smaller than that on the as-extruded samples. The current efficiencies of E-paint on AZ samples (AZ61 and AZ61-H) were higher than those of TZ samples (TZ61 and TZ61-H), and on the heat-treated samples were higher than on as-extruded samples. All E-paintings on the four magnesium substrates had an excellent adhesion without any paint detached by tape peel-test. However, many large blisters were formed on the surface of AZ samples, and none, or very small blisters were observed on TZ samples after immersion test in DI-water for 500 h at 40 °C. Under salt spray test (SST) conditions, E-paint on AZ samples showed blistering adjacent to

scribes, while blistering of E-paint occurred on intact areas of TZ samples. The E-paint on heat-treated samples showed much better corrosion resistance than that on as-extruded samples. The ranking of greater to lesser corrosion resistance of the E-paint on these four different magnesium substrates is indicated by the order: AZ61-H > AZ61 > TZ61-H > TZ61.