

Corrosion Mechanism of a high corrosion-resistance coating in typical extremely harsh environments

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Abstract The corrosion mechanism of a high corrosion resistance Zn-Al-Mg coating submitted to typical extremely harsh environments Wanning and Mohe was investigated. The findings revealed distinct corrosion rate patterns in each location. In Wanning, the corrosion rate initially increased and then decreased, whereas in Mohe, it exhibited the opposite trend. In the marine atmosphere of Wanning with high temperature and high humidity, corrosion preferentially occurs in the eutectic phase and extends to the inner of the coating along the eutectic phase near zinc-rich phase. Oxygen is uniformly distributed, sulfur is located in the upper layer, and chlorine exhibits strong longitudinal migration ability and accumulates within the coating. The corrosion rate on the skyward side was smaller than that on the field-ward side in Wanning, and this difference between two sides decreased initially and later increased. However, in the urban atmosphere of Mohe with extremely low temperature, the local corrosion phenomenon is more obvious. Corrosion pit tends to form in the eutectic phase near the zinc-rich phase, exhibiting a broader upper part and a narrower lower part. The shape of corrosion pit gradually transitions from sharp to shallow. After 6 and 12 months of exposure, the corrosion rate on the skyward side was smaller than that on the field-ward side, and after 24 months of exposure, both sides exhibited similar corrosion rates.

Keywords Zn-Al-Mg coating; Low temperature atmosphere; Marine atmosphere; Atmospheric corrosion