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Al_xMn_{1-x} coatings elaborated by PVD as alternative to cadmium for steel corrosion protection

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Cadmium coatings are still widely used in the aeronautic field for the corrosion protection of aircraft parts made from high strength steel. However, Cd is an inherently toxic heavy metal being restricted under REACH regulation. Only aircraft and military industries are exempt from obeying the banning legislation. In this study, thin coatings of Al₇₀Mn₃₀ at.% and Al₆₀Mn₄₀ at. % alloys have been deposited by magnetron sputtering as an alternative to cadmium for steel corrosion protection. Their microstructures, morphologies and hardnesses have been investigated by X-ray diffraction (XRD), scanning electron microscopy (SEM) and nanoindentation. The corrosion resistance of the coatings has been tested by potentiodynamic polarization and immersion in 3.5 wt.% NaCl solution and by salt spray test (SSP). The corrosion properties were dependent on the coatings microstructures which were influenced by the process parameters. Higher corrosion resistance was reported for Al₇₀Mn₃₀ at.%, up to 216 h in a salt spray cabinet without red rust apparition for 1 µm thick coating deposited at 150 °C.

Keywords

corrosion

durability

steel

PVD

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