On the Role of pre-treatment of Aluminum Substrate on Deposition of Cerium Based Conversion Layers and Their Corrosion-Protective Ability

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doi: 10.20964/2018.06.71

Received: 7 February 2018 / Accepted: 11 April 2018 / Published: 10 May 2018

We've investigated the effect of preliminary Al substrate treatment on the deposition and corrosion-protection ability of thin, conversion cerium oxide layers formed in solutions containing Ce^{3+} and Cu^{2+} ions. The cerium oxide layers and their corrosion protection behaviour were investigated by SEM, EDS, XPS, and model polarization E-lg i and I-t chronoamperometric curves. We report on the structure, morphology, chemical composition and the state of the elements in the conversion layers, as well as the thickness and distribution of the elements up to the „conversion layer”/”aluminium substrate” interphase boundary. The preliminary treatment of the Al substrate, as well as the presence of Cu^{2+} , both substantially influence the thickness, composition and protective ability of the formed ceria and alumina mixed conversion layers. All these features are related to changes in the ratio of the formed AlOOH ($\sim \text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$), $\text{Ce}(\text{OH})_3$ ($\sim \text{Ce}_2\text{O}_3$) and $\text{Ce}(\text{OH})_4$ ($\sim \text{CeO}_2$) on the modified Al surface, which are affected by the preliminary treatment of the Al substrate and presence of Cu^{2+} ions in the immersion treatment solution based on Ce^{3+} ions.

Keywords: Aluminium, Pre-treatment, Conversion layers, Cerium oxides, Corrosion protection

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