ROLE OF ANODIZING PRE-TREATMENT FOR IN-SITU GROWTH OF LDH-NANOCONTAINERS USED FOR ACTIVE CORROSION PROTECTION OF ALUMINUM ALLOY AA2024

M. Serdechnova[1], A. Bouali[1], S. Karpushenkov[2], C. Blawert[1], M.L Zheludkevich[1]
[1]*Helmholtz-Zentrum Geesthacht, Max-Planck Straße 1, Geesthacht, 21502, Germany*
[2]*Belarusian State University, Prospekt Nezavisimosti 4, Minsk, 220030, Belarus*
e-mail: maria.serdechnova@hzg.de

Nowadays, the use of chromate-based treatments is banned in many industrial applications due to their high toxicity. Recently, layered double hydroxides (LDH) have been studied as environmentally friendly nanocontainers, suitable for the corrosion protection of active metal substrates (e.g. aluminum alloy 2024) [1]. It was shown, that LDHs loaded with corrosion inhibitors act as "smart" nanocontainers: the release of a corrosion inhibitor and the formation of a protective layer takes place only when defects appears and corrosion starts. The same idea has been further extended in order to add supplementary self-healing properties to aluminum alloy AA2024 treated by tartaric sulfuric acid (TSA) anodizing and plasma electrolytic oxidation (PEO) methods [1-4]. This combination is important since the properties of hard and well-adherent anodic layers formed during the PEO and TSA treatments are significantly compromised by the presence of defects in the layer (various types of pores and cracks).

In this work, the structure, morphology and composition of PEO and TSA coatings with parental ZnAl LDH-nitrate as well as with LDH loaded with corrosion inhibitor (vanadate) were investigated. It has been shown that the amorphous bohemite phase is suitable for LDH growth, while crystalline α- and γ-Al_2O_3 can not be converted into the LDH containers [5,6]. The corrosion behavior and the effectiveness of LDH formation and inhibitor intercalation were also studied and a remarkable increase in the corrosion resistance of the LDH-inhibitor treated samples in comparison with PEO (and TSA) coated AA2024 specimen was detected. In frame of this work, the mechanism of LDH growth is also proposed (Fig. 1).

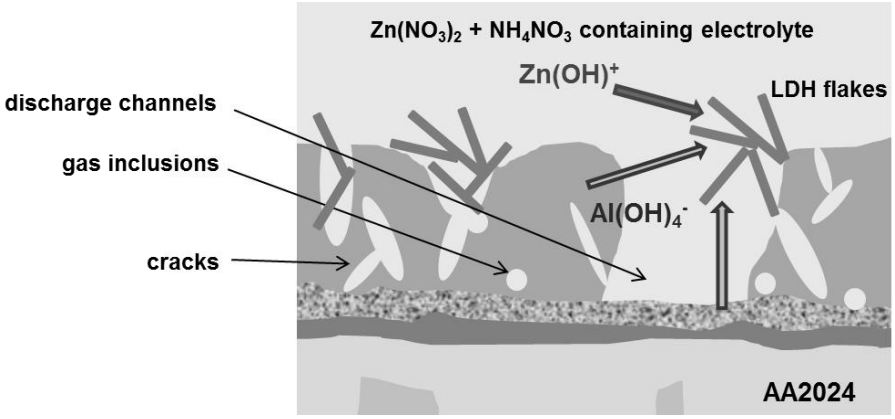

Fig.1: The schematic presentation of aluminum availability for the LDH growth.

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