Corrosion protection of AA2024-T3 alloy by modified hybrid titania-containing sol-gel coatings - DTU Orbit (17/12/2018)

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In this study, a hybrid titania-containing sol-gel coating, designated the 'standard system', has been modified through additions of a co-polymer polyvinyl butyral (PVB), a conductive polymer polyaniline (PANI) and a corrosion resistant glass flake (GF) to investigate the influence of these pigments for the corrosion protection of AA2024-T3 alloy. Electrochemical impedance spectroscopy (EIS) was conducted on these coatings during immersion in 3.5% NaCl solution. Results revealed that modification by PVB in a volume ratio of sol-gel/PVB = 4:1 can increase the resistance to electrolyte ingress of the sol-gel layer, whilst the PANI in agglomerate-type particles produced a chemically stable intermediate layer between the coating and substrate. Additionally, physical barrier properties to water uptake are provided by the modification of the sol-gel with GF. Differential scanning calorimetry and thermogravimetry (DSC/TG) analysis and water contact angle measurements indicated that GF increases the thermal stability and decreases the hydrophobicity. Both properties are improved by modification of PANI and reduced by addition of PVB. Cross-hatch adhesion tests showed high adhesion strength between all the coatings on AA2024-T3 alloy. Fourier.transformed infrared spectroscopy (FTIR) analysis suggested that PVB affected the condensation reactions taking place during the sol-gel synthesis.

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