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Effect of chelating agent acetylacetone on corrosion protection properties of silane-zirconium
sol-gel coatings

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Abstract

The hybrid sol-gel coatings on AA2024-T3 were prepared with a silane coupling agent 3-glycidoxypropyltrimethoxysilane (GPTMS) and a metal alkoxide tetra-n-propoxyzirconium (TPOZ) as precursors. The effect of acetylacetone (AcAc) as a chelating agent on the corrosion protection properties of sol-gel coatings were evaluated and the optimal AcAc/TPOZ molar ratio was obtained. The sol-gel coatings were characterized by atomic force microscopy (AFM), scanning electron microscopy (SEM) and energy dispersive spectroscopy (EDS). The corrosion protection properties of the coatings were evaluated by means of potentiodynamic polarization study (PDS) and electrochemical impedance spectroscopy (EIS). It is demonstrated that AcAc avoids fast hydrolysis of TPOZ and benefits to form stable sols. The coating with AcAc/TPOZ molar ratio of 3 shows the best corrosion protection performance in 0.05 M NaCl solution.

Keywords: Sol-gel coating; Chelating agent; EIS; Corrosion protection

1. Introduction

The sol-gel route is an environment friendly chemical way to produce organic-inorganic

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