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IN PROCESS INDUSTRY
EEM2021

BOOK OF ABSTRACTS



JAHORINA
MARCH 17-19, 2021

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CYSTEINE AND MODIFIED CYSTEINE AS GREEN INHIBITORS OF ALUMINUM ALLOY CORROSION

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Abstract

In its pure form, aluminum is easy to process and has a high level of corrosion resistance. However, due to its low strength the possibility of application of pure aluminum is reduced. When alloyed, aluminum alloys are widely used material in construction, different industries, airspace and military. Commercial 7000 series aluminum alloys have zinc as the main alloying element, followed by magnesium. This 7000 aluminum series offers a very high strength when heat-treated, which comes from its composition. The life time of these alloys is reduced due to corrosion damage. It is known that corrosion directly or indirectly affects materials, human health and safety, and it causes global economic and environmental problem. The use of inhibitors in corrosion protection is the simplest, most economical and most efficient approach that is routinely used to 'reduce' this problem in industry. The most widely used inorganic inhibitors, such as chromates, are not safe, causing health and safety problems due to their toxicity. Organic compounds have increased interest of the scientific community as potential inhibitors in exchange for the most commonly used. The aim of this study was to investigate new green, eco-friendly inhibitors from the group of amino acid and their combination with lanthanides. For the purposes of this investigation, cerium-cysteine complex was synthesized and analyzed by Fourier-Transform Infrared spectroscopy (FTIR), Scanning Electron Microscopy with Energy Dispersive Spectroscopy (SEM / EDS), Potentiostatic Electrochemical Impedance Spectroscopy (PEIS) and Linear Sweep Voltammetry (LSV) analyses. SEM/EDS was used for morphological analysis and to determine the composition of the aluminum alloy on which the electrochemical tests have been performed. Electrochemical measurements (PEIS, LSV) were performed in order to test the inhibitory efficacy in 0.1M NaCl at room temperature. Different concentrations of cysteine and Ce-cysteine complex were examined to optimize the process. The adsorption of the inhibitor follows the Langmuir isotherm, and based on the electrochemical results and calculated thermodynamic potential (Gibbs free energy) it can be concluded that both cysteine and cerium-cysteine complex are mixed type of inhibitors. It can be concluded that both cysteine and Ce-cysteine complex inhibitors satisfactory inhibition effect on aluminum alloy corrosion.

Key words: cysteine, Ce-cysteine complex, corrosion, corrosion inhibitor, aluminum alloy

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