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IMPACT OF THE MICROBIALLY-INDUCED SURFACE MODIFICATIONS IN MARINE ENVIRONMENT ON THE CORROSION BEHAVIOR OF A 5083 ALUMINIUM ALLOY

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Abstract: The present study is part of an ANR Project called Micoatec which aims to develop a new anticorrosive coating technology for the protection of metals based on a biomimetic strategy. The present work consists in studying the surface modifications following the exposure of Al-Mg alloys to a marine environment, and in evaluating the electrochemical properties of the modified surface in order to verify if it can be considered as an effective anticorrosion coating.

The material used is a 5083 aluminium alloy provided as 1 and 7-mm thin sheets. Samples were exposed to marine environment in Genoa* for different durations, i.e. 15 days, 1, 2 and 6 months, leading to surface modifications. The electrochemical properties of the modified surfaces were investigated by polarization tests and electrochemical impedance spectroscopy measurements performed after different immersion times (1h - 480h) in a chloride-containing sulfate solution. The electrochemical tests were combined with surface observations and analyses in order to correlate the electrochemical properties of the modified surfaces with their morphology and structure.

Results showed that, for all samples, the exposure to marine environment led to the growth of a dense layer. For the modified surfaces, a decrease in the cathodic and corrosion current densities and an increase in the passivity range were observed compared to non-exposed samples. Therefore, the layer developed in marine environment presented, for all the samples, an efficiency in terms of anticorrosion protection: this efficiency varied according to the microstructure of the samples and depended on the level of natural light received by the samples during the exposure in marine environment.

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Keywords: aluminium alloys; marine environment; anticorrosion efficiency.

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