Effect of α -tocopherol as a green inhibitor on chloride-induced corrosion of steel

Regina Fuchs–Godec^{1,*}, Milorad V. Tomić², Miomir G. Pavlović²

¹ Faculty of Chemistry and Chemical Engineering, University of Maribor, Smetanova 17, Slovenia,

² University of Eastern Sarajevo, Faculty of Technology Zvornik, Karakaj b.b., Republic of Srpska

*E-mail: regina.fuchs@um.si

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Immersion of stainless-steel (SS) samples of type X4Cr13 in ethanol solutions of stearic acid, with and without addition of α -tocopherol, resulted in a modified surface with hydrophobic and corrosion resistance characteristics. We observed a double effect: a hydrophobic and corrosion-resistant surface of SS type X4Cr13 in a solution of 3.0% (wt.) NaCl at 25°C.

The corrosion properties of bare and modified surfaces of stainless steel were tested by polarization and electrochemical impedance spectroscopy (EIS) in 3.0% (wt.) NaCl solution at 25°C. To observe the morphology and microstructures of sample surfaces, a Scanning Electron Microscope (SEM) was used after the electrochemical measurements. The results obtained from potentiodynamic polarisation measurements show that the inhibition effectiveness of X4Cr13 reached $\approx 68\%$ in cases when surfaces were modified in stearic acid alone (EIS measurements $\approx 82\%$), while the values increased to more than 99.0% (for both methods) with addition of α -tocopherol (E307). Modification of the surface using an immersion method in an ethanol solution of stearic acid, especially with addition of α -tocopherol, appears to be a promising treatment for improving the corrosion resistance of stainless steel (SS) X4Cr13.

Keywords: green inhibitor, steel, high-level-hydrophobic layer, fat soluble vitamin, aggressive media

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