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Synergistic Combination Effect of *Salvia officinalis* and *Lavandula officinalis* on the Corrosion Inhibition of Low-Carbon Steel in the Presence of SO_4^{2-}- and Cl^--Containing Aqueous Environment

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Abstract

The corrosion inhibition of low-carbon steel in 1 M H_2SO_4 and HCl solutions by the admixture of *Salvia officinalis* and *Lavandula officinalis* essential oil extracts was studied through potentiodynamic polarization analysis, coupon measurement and optical microscopy. The carbon steel undergoes severe surface deterioration in H_2SO_4, while the morphology of the steel from HCl showed selective deterioration with numerous corrosion pits in the absence of the oil extracts. The extracts performed effectively in the acid media with optimal inhibition efficiency of 86.92 and 96.90% in H_2SO_4, and 84.68 and 97.59% in HCl from potentiodynamic polarization and coupon analysis. The oil extract displayed anodic inhibition properties in H_2SO_4 due to surface coverage of the steel and cathodic inhibition in HCl due to selective precipitation of extract molecules. Thermodynamic calculations show the extracts adsorbed onto the steel surface, effectively suppressing the corrosion reactions through

chemisorption mechanism according to the Langmuir, Frumkin and Freundlich adsorption isotherms.

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