

Synergistic Effect of *Zizyphus Spina-Christi* and Chloride Ions on the Corrosion Inhibition of Mild Steel in Sulfuric Acid Solution

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ABSTRACT

The effect of chloride ion addition on the corrosion and corrosion inhibition of mild steel in 1.0 M sulfuric acid (H₂SO₄) containing 10% ethanol (EtOH) at 30°C in the absence and presence of aqueous and/or alcoholic extracts of Zizyphus spina-christi (ZSC) plant have been investigated using chemical and electrochemical measurements. The addition of chloride ions leads to stimulation of corrosion at $\leq 10^{-4}$ M of chloride ions, but at concentrations $> 10^{-4}$ M chloride, an increase in the chloride concentration produces corrosion inhibition of mild steel. A synergistic effect was observed between the chloride ions and the studied extracts. Experimental results suggest that the presence of chloride ions stabilized the adsorption of ZSC extract molecules on the mild steel surface and therefore improved the inhibition efficiency of ZSC. The synergistic behavior of the chloride ions and extract components can be attributed to cooperative adsorption or competitive adsorption.

KEYWORDS: *chloride ions, corrosion inhibition, mild steel, sulfuric acid, synergistic, Zizyphus spina-christi*