

## Corrosion and Corrosion Inhibition of Mild Steel in H<sub>2</sub>SO<sub>4</sub> Solutions by Zizyphus Spina-Christi as Green Inhibitor

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### Abstract

*The corrosion and corrosion inhibition of mild steel in 1.0 M H<sub>2</sub>SO<sub>4</sub> containing 10% ethyl alcohol (EtOH) by Zizyphus Spina-Christi (ZSC) extracts (aqueous extract and alcoholic extract) has been studied using chemical techniques (hydrogen evolution(HE) and mass loss(ML)) and electrochemical techniques (electrochemical impedance spectroscopy(EIS) and potentiodynamic polarization(PDP)). The effect of acid concentration on the corrosion rate of mild steel increases with acid concentration (0.25-1.5) M showing first order corrosion reaction without changing the reaction mechanism, and the results showed that when the concentration of ZSC extracts (aqueous extract and alcoholic extract) increased the rate of steel corrosion is decreased, which indicates that the inhibition of the corrosion process is produced. Electrochemical impedance spectroscopy results showed that the corrosion and corrosion inhibition of steel occurred mainly by charge transfer. The electrochemical results of polarization also showed that the extracts of ZSC plant act as mixed type inhibitors, they retarded both cathodic and anodic reaction. The experimental results from chemical and electrochemical studies were fit Langmuir isotherm. Values of equilibrium constant of adsorption  $K_{ads}$  and the standard free energy of adsorption  $\Delta G^{\circ}_{ads}$ , for the extracts are calculated.*

**Keywords:** Corrosion, Inhibition, Mild steel, Zizyphus Spina-Charisti, Acids, Sulphuric acid