

Investigation of the Inhibitive Action of Eugenol and Leaf Extract of Cinnamon (*Cinnamomum zeylanicum*) on Mild Steel (MS) Corrosion in Salty and Acidic Media

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Corrosion of metal surfaces, especially mild steel (MS) has a large impact on the global economy due to its wide applications. Synthetic chemicals on prevention or inhibition of corrosion of MS are associated with a high cost and environmental threats. Therefore natural inhibitors would be a good alternative since they provide solutions to those problems. Although many plant extracts have been investigated as corrosion inhibitors, active components in each case have been rarely studied. Acid extraction of cinnamon leaves was previously used as an inhibitor for MS corrosion prevention; however, active compounds have not been investigated.

Since cinnamon leaves contain 81-85% of eugenol and 2-3% of cinnamaldehyde, isolated eugenol (IEUG) from steam distillate of cinnamon leaves was studied for inhibition of MS corrosion in media having pH of 0.5 and 0.1 mol dm⁻³ NaCl. Corrosion inhibition of IEUG was then compared with steam distillate of cinnamon leaves (SDCL), commercially available cinnamaldehyde (CACIN) and commercially available eugenol (CAEUG) in relation to open circuit potential (OCP) measurements, mass (weight) loss measurements (WLM), electrochemical impedance spectroscopy (EIS) and linear polarization.

All methods revealed the same trend demonstrating the maximum inhibition efficiency (IE%) of 95.8% by CAEUG in 0.2% V/V solution compared to 92.7%, 92.5%, and 90.0 % of IEUG, CACIN and SDCL, respectively. Comparatively SDCL is ineffective as an inhibitor. Also results prove that eugenol acts better than cinnamaldehyde in corrosion prevention of MS, thus isolated eugenol from cinnamon leaf distillate can be effectively used as a metal corrosion inhibitor. Eugenol may show different electrochemical mechanism as compared to cinnamaldehyde and steam distillate. All four inhibitors followed Langmuir adsorption isotherm. Negative values of all inhibitors for Gibbs free energy for the adsorption (ΔG_{ads}) confirms the stability of the inhibitor layers formed on MS surface and the spontaneity of the adsorption process.

Key Words- Mild steel, corrosion inhibition, aggressive media, cinnamon leaves, eugenol

