EFEK SINERGETIK ION IODIDA TERHADAP INHIBISI KOROSI BAJA LUNAK DENGAN EKSTRAK DAUN KAYU MANIS (*Cinnamomum burmanni* (Nees dan T. Nees) Blume) DALAM LARUTAN HCl 1 M

TESIS

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Abstrak

Efek sinergis ion iodida pada inhibisi korosi baja lunak oleh ekstrak daun kayu manis (*Cinnamomum burmanni* (Nees dan T. Nees) Blume) dalam larutan HCl 1 M telah diselidiki. Efektivitas penghambatan korosi diukur dengan berbagai metode seperti kehilangan berat, polarisasi potensiodinamik, spektroskopi impedansi elektrokimia (EIS), dan pengukuran sudut kontak. Analisis permukaan dilakukan menggunakan spektrofotometri UV-Vis, FTIR, SEM, dan XRD. Efektivitas penghambatan meningkat dengan meningkatnya konsentrasi ekstrak dan suhu, mencapai 92,82% pada 10 g/L dan 60°C. Penambahan ion iodida memberikan efek sinergis, meningkatkan efektivitas penghambatan hingga 97,06% dalam kondisi yang sama. Adsorpsi mengikuti model isoterm Langmuir. Parameter termodinamika menunjukkan bahwa proses adsorpsi ini spontan dan endotermik. Polarisasi potensiodinamik menunjukkan bahwa ekstrak ini bekerja sebagai inhibitor tipe campuran. EIS mengindikasikan pembentukan lapisan pelindung pada permukaan baja. Hidrofobisitas permukaan baja meningkat dengan adanya inhibitor. Analisis UV-Vis mengindikasikan pembentukan kompleks antara ekstrak dan permukaan baja. Analisis FTIR dan XRD menunjukkan interaksi antara molekul inhibitor dan permukaan baja. Gambar SEM menunjukkan permukaan yang lebih halus dengan kerusakan korosi yang lebih sedikit dengan adanya inhibitor. Ekstrak daun kayu manis, terutama dengan penambahan ion iodida, merupakan inhibitor korosi yang sangat efektif dan ramah lingkungan untuk baja lunak dalam lingkungan asam, dengan mekanisme kerja yang melibatkan adsorpsi kimia dan fisika serta pembentukan lapisan pelindung.

Kata Kunci: *Cinnamomum burmanni* (Nees dan T. Nees) Blume, Baja lunak, Inhibitor korosi, Kehilangan berat, Efek sinergetik

SYNERGISTIC EFFECT OF IODIDE IONS ON THE CORROSION INHIBITION OF MILD STEEL WITH CINNAMON LEAF EXTRACT (*Cinnamomum burmanni* (Nees and T. Nees) Blume) IN 1 M HCl MEDIUM

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Abstract

The synergistic effect of iodide ions on the corrosion inhibition of mild steel by cinnamon leaf extract (*Cinnamomum burmanni* (Nees and T. Nees) Blume) in 1 M HCl solution has been studied. The inhibition efficiency was measured using several methods, such as weight loss, potentiodynamic polarization, electrochemical impedance spectroscopy (EIS), and contact angle measurements. Surface analysis was done using UV-Vis spectrophotometry, FTIR, SEM, and XRD. The results showed that the inhibition efficiency increased as the extract concentration and temperature increased, reaching 92.82% at 10 g/L and 60°C. The addition of iodide ions gave a synergistic effect, further improving the efficiency to 97.06% under the same conditions. The adsorption process followed the Langmuir isotherm model, suggesting that a monolayer of extract molecules formed on the steel surface. Thermodynamic analysis indicated that the adsorption was spontaneous and endothermic. Potentiodynamic polarization showed that the extract works as a mixed-type inhibitor, meaning it slows down both anodic and cathodic reactions. EIS results confirmed the formation of a protective film on the steel surface. The hydrophobicity of the surface increased when the inhibitor was present. UV-Vis analysis suggested the formation of a complex between the extract and steel surface. FTIR and XRD results also confirmed interactions between inhibitor molecules and the steel surface. SEM images showed that the steel surface became smoother and had less corrosion damage when the inhibitor was used. Cinnamon leaf extract, especially with the addition of iodide ions, is a highly effective and environmentally friendly corrosion inhibitor for mild steel in acidic environments, with a mechanism of action involving chemical and physical adsorption and the formation of a protective layer.

Keywords: *Cinnamomum burmanni* (Nees dan T. Nees) Blume, Mild Steel, corrosion inhibitor, Weight Loss, Synergistic Effect