Pemanfaatan ekstrak ubi ungu sebagai inhibitor organik alternatif pada korosi logam baja (API 5L) dalam lingkungan 3,5% NaCl = Utilization of purple sweet potato extract as an alternative organic corrosion inhibitors to metal steel (API 5L) in the environment 3,5% NaCl

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Abstrak

Penelitian pemanfaatan ekstrak tumbuh-tumbuhan sebagai inhibitor korosi belakangan ini semakin meningkat seiring dengan meningkatnya permintaan penggunaan bahan-bahan kimia yang ramah lingkungan. Pemanfaatan ekstrak tumbuh-tumbuhan sebagai inhibitor korosi menjadi penting mengingat karakteristiknya ramah lingkungan (green inhibitor), mudah ketersediaannnya, sumberdaya yang melimpah dan dapat diperbaharui, prosedur produksi yang sederhana, dan biaya produksi yang cukup kompetitif.
Dalam penelitian ini dilakukan pengujian eksperimental efek sinergis jenis inhhibitor baru yaitu ekstrak ubi ungu (Ipomoea batatas L.) yang memiliki kandungan utama antosianin dengan inhibitor komersial berbasis amine (aniline) dan dengan inhibitor asam askorbat.
Penelitian bertujuan untuk menganalisis laju kororsi dan efisiensi inhibisi korosi logam baja (API 5L) di dalam lingkungan air terproduksi menggunakan inhibitor campuran ekstrak ubi ungu dan inhibitor komersial berbasis amine (aniline). Selain itu dilakukan pula analisis laju korosi, efisiensi inhibisi, mekanisme proteksi dan model lapisan inhibisi korosi logam baja (API 5L) di dalam lingkungan 3,5% NaCl menggunakan inhibitor campuran ekstrak ubi ungu dan asam askorbat.
Metode pengukuran laju korosi dan efisiensi inhibisi dilakukan menggunakan elektrokimia kurva polarisasi. Mekanisme korosi diteliti dengan menggunakan metode Electrochemical Impedance Spectroscopy (EIS). Untuk menganalisis model lapisan inhibisi dilakukan dengan menggunakan metode Fourier Transform Infra Red (FTIR) spectroscopy.
Hasil penelitian menunjukan bahwa pencampuran ekstrak ubi ungu memiliki kemampuan sinergis dengan inhibitor komersial berbasis amine (aniline) pada fraksi volume ekstrak ubi ungu sebesar 25% dengan menghasilkan efisiensi inhibisi sebesar 82,14%. Sebagai pembanding, pada sistem yang sama penggunaan esktrak ubi ungu saja menghasilkan efisiensi inhibisi 68,30%, sedangkan penggunaan inhibitor komersial berbasis amine (aniline) saja menghasilkan efisiensi inhibisi 74,88%.
Penambahan volume ekstrak ubi ungu dari 1 mL hingga 4 mL kedalam inhibitor asam askorbat 10-4 M meningkatkan efisiensi inhibisi korosi logam baja (API 5L) dalam larutan 3,5% NaCl dari efisiensi inhibisi sebesar 23,37% menjadi 57,52%. Campuran inhibitor korosi tersebut berpengaruh terhadap kurva polarisasi anodik maupun katodik sehingga dapat berperan sebagai mixed inhibitor. Pengujian EIS menunjukan proses korosi dikontrol oleh mekanisme pasivasi yang ditunjukan oleh adanya peningkatan tahanan permukaan korosi.
Pada lapisan permukaan terjadi proses adsorpsi dan pembentukan kelat organo (flavonoid) logam dimana ekstrak ubi ungu dengan kandungan utama antosianin berperan sebagai pembentuk metal-chelated. Pembentukan kelat ekstrak ubi ungu-Fe-asam askorbat terjadi pada gugus hidroksil dan karbonil. Lokasi terjadinya ligan kelat ekstrak ubi ungu dengan kandungan utma antosianin terjadi pada ikatan 3?, 4? Dihydroxy cincin B atau 3-Hydroxy 4-Carbonyl cincin C.

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Research of utilization of plant extracts as a corrosion inhibitor recently increased along with the increasing demand for the use of chemicals that are environmentally friendly. Utilization of plant extracts as a corrosion inhibitor becomes important given the characteristics of environmentally friendly (green inhibitor), easy availability, resources are abundant and renewable, the production procedure is simple, and the production costs are quite competitive. In this research, experimental testing of the synergistic effects of new types inhibitor ie extract purple potato (Ipomoea batatas L.) which has the main content of anthocyanin with commercial inhibitor-based amine (aniline) and with ascorbic acid inhibitors.
The study aims to analyze the rate of corrosion and metal corrosion inhibition efficiency of steel (API 5L) in the produced water environment using a mixed inhibitor purple sweet potato extract and commercial-based inhibitors of amine (aniline). In addition, the corrosion rate analysis was also performed, inhibition efficiency, protection mechanisms and models of metal corrosion inhibition layer steel (API 5L) in the neighborhood of 3.5% NaCl using a mixed inhibitor purple sweet potato extract and ascorbic acid.
Method of measuring the rate of corrosion and inhibition efficiency was performed using electrochemical polarization curves. Corrosion mechanisms investigated by Electrochemical Impedance Spectroscopy (EIS). To analyze the model layer of inhibition were calculated using Fourier Transform Infra Red (FTIR) spectroscopy.
The results showed that mixing purple sweetpotato extract has the ability to synergistically with commercial inhibitor-based amine (aniline) in purple sweetpotato extract volume fraction of 25% with a yield of 82.14% inhibition efficiency. For comparison, the same system using purple sweet potato extract only produce inhibition efficiency of 68.30%, while the use of commercial-based inhibitors of amine (aniline) alone resulted in inhibition efficiency of 74.88%.
The addition of purple sweet potato extract volume of 1 mL to 4 mL into ascorbic acid inhibitors 10-4 M improving steel metal corrosion inhibition efficiency (API 5L) in a solution of 3.5% NaCl of inhibition efficiency of 23.37% to 57.52%. The corrosion inhibitor mixture affect the anodic and cathodic polarization curves so that it can act as a mixed inhibitor. Testing EIS shows the corrosion process is controlled by the passivation mechanism indicated by an increase in the surface resistance of corrosion.
On the surface layer of a process of adsorption and formation of organo chelates (flavonoids) in which the metal purple sweet potato extract with the main content of anthocyanins act as forming metal-chelated. Location of the chelating ligand purple sweet potato extract with the main content of anthocyanins occur in bond 3 ', 4' dihydroxy ring B or 3-Hydroxy 4-Carbonyl ring C.