Corrosion Inhibition Behaviour of Calf Thymus Gland DNA on Mild Steel in 10% Sulphamic Acid

- Isaac E. Ekere,
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Abstract

The use of corrosion inhibitors is a major practical method for reducing the corrosion of mild steel in corrosive environments. Weight loss, potentiodynamic polarization (electrochemical) measurements and SEM analyses were used to examine the corrosion inhibition behaviour of calf thymus gland DNA (CTG_{DNA}) in 10% sulphamic acid. Weight loss data demonstrated that the highest inhibition efficiency of 82.71% was reached at 303 K and 6 h of immersion with calf thymus DNA at a concentration of 2.5 mg/L. The electrochemical test, with a change in $E_{corr} < 85$ mV seen in potentiodynamic polarisation curves, verified that CTG_{DNA} functions as a mixed inhibitor, by creating a barrier on the mild steel's surface, it inhibited both the anodic dissolution of the metal and the cathodic oxygen reduction. CTG_{DNA} adsorption on mild steel modelled the Langmuir isotherm with a linear regression coefficient of 0.99. The increase in the activation energy from − 37.54 to 52.5 kJ/mol after 2 h immersion; with a similar trend for 4 and 6 h demonstrated that addition of CTG_{DNA} favoured chemisorption. The small and negative value of entropy was an indication that the adsorption of CTG_{DNA} was spontaneous. SEM images demonstrated that the addition of CTG_{DNA} significantly decreased the mild steel surface deterioration in the uninhibited solution. It is the conclusion of this study that CTG_{DNA} is an effective inhibitor of mild steel corrosion in 10% sulphamic acid.

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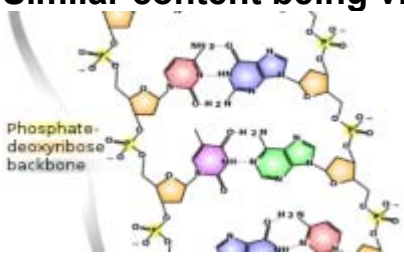

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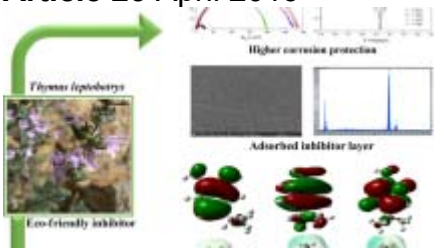

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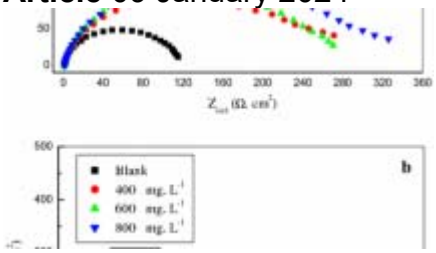

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Article Open access27 August 2016

Data Availability

No datasets were generated or analysed during the current study.

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Contributions

Isaac Ekere, Oluranti Agbolola and Augustine O. Ayeni made substantial contributions to the conception of the work. They also revised it critically for important intellectual content. Isaac Ekere contributed to the acquisition, analysis and interpretation of data and drafted the work. The authors also wish to thank covenant university, because this study was conducted during an academic program in covenant university.

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Ethics declarations

Competing Interests

The authors declare no competing interests.

Ethical Approval

Ethical approval was not required for this work as there were no live human and animal trials.

Consent to Participate

Consent to participate is not applicable as there were no live human and animal trials.

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