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Improved Corrosion Resistance of Mild Steel against Acid Activation: Impact of Novel *Elaeis guineensis* and Silver Nanoparticles

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Highlights

- This study showed a synthesis of silver nanoparticles (AgNPs) in leaf extracts of the oil palm (*Elaeis guineensis*) (EG) as a novel green nanoparticles inhibitor (EG/AgNPs) to inhibit corrosion of mild steel in 1 M $HCl_{(aq)}$.
- A maximum inhibition efficiency of 94.1% was achieved by using 10% (v/v) of EG/AgNPs inhibitor.
- Microstructure analyses proved that the (EG/AgNPs) adsorbs to the mild steel surface by physical mechanisms, including formation of a protective film.
- The adsorption of the EG/AgNPs inhibitor compounds onto the mild steel was identified as conforming to the Langmuir adsorption isotherm.

Abstract

Influence of novel green *Elaeis guineensis* (EG) and silver nanoparticles (AgNPs) on the improved corrosion resistance of mild steel against acute acid attack is reported. Such EG/AgNPs were synthesized from palm oil leaf extracts and used as inhibitor with varying contents to inspect the feasibility of modifying the acid (1 M $HCl_{(aq)}$) mediated anti-corrosion behaviour of mild steel. The structural and morphological properties of the extracted EG/AgNPs inhibitor (in powder form) were determined using TEM, XRD, and EDX analyses. Furthermore, the acid solution exposed mild steel specimens were characterized via FESEM, EDX, AFM, XRD, weight loss, polarization and electrochemical impedance