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Exploration of the Corrosion Inhibition Potential of Cashew Nutshell on Thermo-Mechanically Treated Steel in Seawater

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Abstract

This study explores the non-edible part of Cashew nutshell for possible conversion to useful product as a corrosion inhibitor for thermo-mechanically treated steel (TMT) in seawater. Herein, methanolic Cashew nutshell extract is examined as a corrosion inhibitor for TMT in seawater. The extract is rich in compounds such as saponins, phenol, and terpenoids according to results obtained from phytochemical analysis. The inhibitive performance of the extract was assessed using the gravimetric, spectroscopic, and electrochemical methods complemented with scanning electron microscope studies.
The extract is effective in controlling the corrosion of TMT in seawater with 500 ppm capable of exerting over 75% inhibition efficiency at 30 °C for as long as 15 days. Results from spectroscopic studies [ultraviolet–visible spectroscopy

(UV–Vis) and Fourier transform infrared spectroscopy (FTIR)] reveal that the extract inhibits the TMT corrosion by adsorptive mechanism using the oxygen atoms and the aromatic rings that characterized the extract's components. However, the protection efficiency of the extract slightly depreciated with rise in the temperature of the corrosive medium. The surface morphological studies show evidence of extract components adsorption on the TMT surface, and the FTIR results confirmed the observation. The Cashew nutshell extract could be a sustainable source for the formation of an effective corrosion inhibitor for TMT, which is a common engineering material in seawater environment.

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