

A comparative study of the corrosion inhibition performance on cold rolled steel in sulfamic acid medium between refluxing and ultrasonic extracts of rapeseed meal

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Abstract Rapeseed is the second largest oilseed crop in the world after soybeans. Effective utilization of its by-product of rapeseed meal (RM) can improve its economic value and promote the development of the rapeseed industry. Refluxed and ultrasonic rapeseed meal extracts (RRME and URME) were developed as novel steel corrosion inhibitors due to their chemical components containing substantial important organic compounds such as carbonyl compounds, flavonoids, and organic acids. The inhibition performances of both RMEs against cold rolled steel (CRS) corrosion in sulfamic acid (SA) medium were evaluated by weight loss method, electrochemical measurement, and surface characterization. It is found that these two RMEs can be regarded as hybrid inhibitors, which spontaneously form organic films with low fraction free volume (FFV) and low self-diffusion coefficient (self- D) on the CRS surface to achieve the highest inhibition efficiencies of 92.4 % and 95.4 % for RRME and URME, respectively, at the same concentration of 100 mg L⁻¹. However, RRME has better inhibition performance and stability with the extension of immersion time in weight loss and temporal electrochemical impedance spectroscopy (EIS) tests. This study provides a new insight into the application of rapeseed meal as a novel steel corrosion inhibitor.

Keywords: Rapeseed meal; Corrosion inhibition; Adsorption; Quantum chemical calculation; molecular dynamic simulation

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