



602/E2

Corrosion prevention of mild steel in simulated pickling bath environments using natural products

Rathiga Senthoooran¹ and Namal Priyantha^{1,2*}

¹*Postgraduate Institute of Science, University of Peradeniya, Peradeniya*

²*Department of Chemistry, University of Peradeniya, Peradeniya*

Addition of corrosion inhibitors to pickling baths is a common practice to prevent over pickling of metals. Toxic effects of synthetic corrosion inhibitors on the environment and human being necessitate the search for green inhibitors, and consequently, use of natural products became attractive recently. As HCl is a common acid used in pickling baths, the effect of acidic extracts of cinnamon leaves on corrosion of mild steel, which is used for the production of galvanized steel, in HCl solutions of concentrations ranging from 0.1 mol dm⁻³ to 2.0 mol dm⁻³ was investigated using a multi-technique approach, including mass loss and pH measurements, electrochemical impedance spectroscopy, and potentiodynamic polarization techniques.

Increase in the pH of the corrosive medium with time and high mass loss in the absence of the extract indicate the high dissolution rate of mild steel. Introduction of the cinnamon leaves extract significantly reduces the rate of mass loss and change in pH. Based on mass loss measurements, 60 g dm⁻³ extract provides more than 90% inhibition efficiency in all tested acid concentrations after 24 h immersion. Further, the extract continues to show a significant inhibition effect over a period of 7 days. Electrochemical experimental results show that the presence of cinnamon leaves extract increases the polarization resistance and decreases the corrosion current density significantly, conclusively demonstrating the high inhibition potential of cinnamon leaves extracts.

Results obtained from all experimental techniques conducted at ambient temperature reveals that cinnamon leaves extracts act as a potential inhibitor for corrosion of mild steel in HCl solutions of concentrations ranging from 0.1 mol dm⁻³ – 2.0 mol dm⁻³, which represents the pickling bath composition.