

Inhibition of mild steel corrosion in hydrochloric acid by anisaldehyde thiosemicarbazone and pyridoxal thiosemicarbazone

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Corrosion inhibition of mild steel in HCl by pyridoxal thiosemicarbazone (PHTSC) and anisaldehyde thiosemicarbazone (ATSC) at 303-333 K and concentrations of 0.0001-0.0005 M has been studied using weight loss technique. Inhibition efficiencies of 88% and 60% have been obtained at 333 K and 0.0005 M concentration for PHTSC and ATSC respectively. Both inhibitors exhibit first order type of mechanism on the basis of temperature effect. The difference in inhibitory properties of compounds has also been incorporated in the study.

Keywords: Anisaldehyde thiosemicarbazone (ATSC), Corrosion, Mild steel, Pyridoxal thiosemicarbazone (PHTSC)

Introduction

Organic compounds containing nitrogen and sulphur have been reported¹⁻⁶ effective in inhibiting the corrosion of mild steel in acidic solutions. Further, promising organic compounds have been investigated as corrosion inhibitors for mild steel in acidic media⁷⁻¹². Present study reports on the inhibitory actions of inhibitors (Fig. 1), anisaldehyde thiosemicarbazone (ATSC) and pyridoxal thiosemicarbazone (PHTSC), on mild steel in hydrochloric acid (HCl) solution.

Experimental Procedure

Materials Preparation

Mild steel¹³ sheet was mechanically cut into coupons (5cm x 4cm) having a hole at one end for the insertion of hooks. Coupons (surface area, 40 cm²) were degreased in absolute ethanol and mill scales removed by mild scrubbing with bristle brush, rinsed in absolute ethanol again, dried in acetone and stored in a desiccator. Additives used as inhibitors were recrystallized twice from absolute ethanol and dried in air. Inhibitor concentrations (0.0001-0.0005 M) in increments of 0.0001 M were prepared in 0.1M HCl solution.

Weight Loss Determination

Inhibition efficiency (I %) has been determined¹⁴ as

$$I (\%) = \left(1 - \frac{W_1}{W_0} \right) \times 100 \quad \dots (1)$$

where W_0 and W_1 are weight losses of mild steel in HCl solutions without inhibitor and with inhibitor respectively.

Results and Discussion

Effect of Inhibitor Concentration

Presence of PHTSC and ATSC exhibits lower corrosion rates (Fig. 2) as compared with the rates in

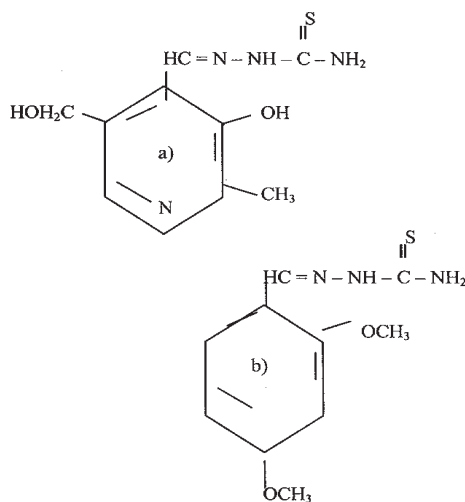


Fig. 1 – Inhibitors: a) Pyridoxal thiosemicarbazone (PHTSC); and b) Anisaldehyde thiosemicarbazone (ATSC)

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