CORROSION INHIBITION OF ALUMINIUM USING CINNAMALDEHYDE

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The effect of butanone, benzaldehyde, crotonaldehyde and cinnamaldehyde (model compounds) as corrosion inhibitors toward aluminium in 0.10 mol dm^{-3} (in 20% methanol) as the corrosive medium, has been investigated at pH 2.0. Even though aluminium shows corrosion resistance under normal conditions, it undergoes pitting corrosion in chloride-rich environments. Corrosion inhibition is therefore important to maintain the quality of aluminium objects. Mass loss measurements, electrochemical impedance spectroscopic measurements, pH variation and Tafel slope analysis were applied in this investigation to evaluate the corrosion inhibitive ability of the selected compounds as corrosion inhibitors. It is conclusive that cinnamaldehyde has the highest corrosion inhibition efficiency, followed by benzaldehyde, crotonaldehyde and butanone, respectively. Moreover, it is evident that, with the increase in the concentration of the inhibitor, the efficiency of inhibition of corrosion increases for the all compounds investigated. In addition, 0.10 mol dm^{-3} NaCl in distilled water was used as the corrosive medium to investigate the effect of butanone on the corrosion of aluminium in aqueous medium. Butanone in 20% methanolic solution inhibits aluminium corrosion more effectively as compared to butanone in 100% aqueous medium. Mass loss measurements of aluminium plates in 20% methanol:water and 100% water suggest the corrosion inhibitive action of methanol toward aluminium in addition to that of the model compounds.

By comparing the corrosion parameters (corrosion rate, percentage inhibition efficiency and surface coverage) obtained for the model compounds, a mechanism for the adsorption of cinnamaldehyde molecules on the aluminium surface has been proposed. Aldehyde carbonyl group (>C=O) and the benzene ring were identified as the most contributing functional groups for the adsorption process, while the effect of C=C was found to be not as significant as the other two. However, by comparing the corrosion parameters for butanone and crotonaldehyde, it is proposed that the contribution of C=C to the inhibition action of cinnamaldehyde toward aluminium is less as compared to that of the other functional groups.