

Corrosion Inhibition Ability of Cinnamon Oil on Aluminum in Alkaline Medium


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Abstract

Aluminum (Al) is one of the most common metals used in industrial applications, such as in alkaline batteries, packaging of medicine and kitchen utensils. Raw aluminum shows a very high affinity toward oxygen, and consequently, aluminum surfaces, when exposed to air or any other oxidizing agent, a thin, hard film of aluminum oxide is quickly formed. The aluminum oxide film formed is corrosion-resistant within the optimal pH value in the range from 4 to 9. Acids and bases break down the oxide layer, thereby opening up the raw aluminum surface, which subsequently undergoes the corrosion in the form of pitting. Therefore, it is important that suitable corrosion inhibition methods be employed to enhance the stability of the aluminum surface. The corrosion inhibition property of cinnamon oil extracted from *Cinnamomum verum* leaves was studied using open circuit potential measurements, linear polarization and Tafel extrapolation technique and electrochemical impedance spectroscopy (EIS). All these methods confirm that cinnamon oil exhibits strong corrosion inhibition characteristics toward Al. In particular, the corrosion inhibition efficiency, determined through EIS, is increased from 76% to 97% when the concentration of NaOH is decreased from 0.070 mol L⁻¹ to 0.010 mol L⁻¹. Moreover, increase in solution temperature from 313 K to 333 K causes inhibition efficiency to drop down from 99% to 75% according to EIS measurements. The results suggest that cinnamon oil acts as an effective corrosion inhibitor for Al at lower concentration of NaOH solution at lower temperatures.

Keywords: Alkaline, aluminum, cinnamon oil, corrosion, inhibition

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