



Inhibition and Adsorption Actions of Nano Curcumin for Corrosion of Carbon Steel Alloy in 3.5% NaCl Solution

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Abstract: The corrosion inhibition of carbon steel in 3.5% NaCl solution by nanocurcumin has been studied at temperature range (298-328K) and different concentrations (2.7×10^{-6} , 1.3×10^{-5} , 2.7×10^{-5} and 4.1×10^{-5} M) using potentiostatic techniques. The obtained data shows that the corrosion rate increase with temperature increase at all nanocurcumin concentrations, also it decrease with nanocurcumin concentration increase up to 2.7×10^{-5} M then with increasing nanocurcumin concentration more than 2.7×10^{-5} M the corrosion rate will increase. The results showed that the best inhibition efficiency obtained with 2.7×10^{-5} M nanocurcumin concentration which equal to 86.21% at 298K. The Kinetics (Apparent activation energy E_a , arrhenius factor A) and Thermodynamics (free energy ΔG^* , enthalpy ΔH^* and entropy ΔS^* of activation) parameters for corrosion processes were calculated. Study the adsorption behavior of nanocurcumin inhibitor by adsorption isotherm has been done and values of K_{ads} , ΔH_{ads} , ΔS_{ads} and ΔG_{ads} for adsorption process were calculated. The adsorption of nanocurcumin on carbon steel surface is chemisorption type and it obey Langmuir adsorption isotherm. Nano curcumin inhibitor powder and the adsorbed layer on C.S surface in the best inhibition efficiency and best temperature were analyzed by AFM and FTIR spectra in order to study the change in particles size and functional groups respectively.

Keywords: Corrosion, Corrosion Inhibitors, Nano Curcumin, Langmuir Adsorption Isotherm.

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