

Black tea extract as an eco-friendly corrosion inhibitor for mild steel under CO₂ condition

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Abstract

In the oil and gas industry, inhibitor injection is one of the most efficient and economic approaches for mitigating corrosion. In this study, the inhibition ability of black tea extract on the corrosion behavior of 1Cr carbon steel was investigated. Moreover, the effect of the filtering process on the inhibition efficiency of the material used was examined. Tests were conducted at atmospheric pressure in a 1wt.% NaCl solution saturated with CO₂ at 40 and 60 °C with different inhibitor concentrations (from 50 to 4000 ppm). Linear Polarization Resistance (LPR) was used to study the electrochemical behavior. Scanning Electron Microscopy (SEM) was employed to analyze the phase composition and morphology of the film formed. Results showed that the inhibitor protects materials from corrosion, therefore changing the morphology and properties of the formed corrosion layers. Furthermore, extract synthesis method found to influence the inhibitor efficiency. Increase in temperature found to increase inhibitor efficiency.

Keywords

Inhibitor; Carbon steel; CO₂ corrosion; Iron carbonate; EIS; LPR