

Evaluation of Nanoscale Environmentally Friendly Inhibitors for Corrosion of low Carbon Steel in 3.5% NaCl Salt Solution by Hajir Amer Jaddoa

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Abstract

One of the most major issues is corrosion in the petroleum industries. So, an aqueous turmeric

powder extract and orange peel are used as a promising corrosion inhibitor to control low-carbon

steel corrosion in 3.5% NaCl. Weight loss and polarization studies were used while an evaluation

was performed on a low-carbon steel specimen to ascertain its corrosion resistance when subjected

to a 3.5% NaCl salt solution. This evaluation employed the weight loss technique with inhibitor

concentrations (400, 600, 800, 1000, 1200, and 1400 ppm) at 25 °C and the

concentrations were (400, 600, 800, 1000, and 1200 ppm) at 25 °C in the polarization technique. The

results demonstrate that the adsorption process transpires on the metal's surface, which means that

an increase in inhibitor concentration leads to enhanced inhibition efficacy. In polarization technique, the inhibitory efficacies attain a maximum of 80.43 and 97.27% for orange peel and

turmeric respectively at 1200 ppm. A weight loss study found that the turmeric extract inhibits

corrosion at 96.23% while the orange peel was 83.52% at 1400 ppm. So, it can be used these findings

in petroleum equipment. Polarization measurements employing the Tafel Extrapolation technique and

electrochemical impedance spectroscopy (EIS) were performed to analyze the sample under optimal

conditions. The weight loss and polarization data indicated that the corrosion rate escalated in

the absence of an inhibitor, increasing the concentration of inhibitors results in a further decrease in the corrosion rate. Many tests of characterization for the carbon steel surface specimens before and after the corrosion process were done FTIR to know the active groups such as

(C-H), (C-O), and (C=C), FESEM which through this test we find formation of protective film, AFM to

study of surfaces at the nanoscale, where got the surface roughness 120 nm for orange peel and

96.76 nm for the turmeric, and contact angle.

