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Electrochemical and anticorrosion properties of 5-hydroxytryptophan on mild steel in simulated well acidizing fluid

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Abstract

Anticorrosion effect of 5-hydroxytryptophan (5-HTP) on mild steel (MS) was investigated by gravimetric and electrochemical techniques. Two different concentrations (1 M and 15 %) of hydrochloric acid were used to simulate well acidizing fluid. Results show that in 10×10^{-5} M 5-HTP is 96.1% efficient in 1 M HCl and 78.1% efficient in 15 % HCl at 30 °C. The efficiency decreases as temperature increases, reaching 66.9 % and 39.8 % in 1 M and 15 % HCl respectively at 90 °C. When 5-HTP is blended with potassium iodide and glutathione, the efficiency **increases to values** above 88 % and 78 % in 1 M and 15 % HCl respectively at 90°C. Increase in 5-HTP concentrations decreases the double layer capacitance and increases charge transfer resistance. 5-HTP behaves as mixed type corrosion inhibitor with anodic predominance and is spontaneously adsorbed on the steel surface. Physisorption of 5-HTP is best described by Langmuir adsorption model and is also exothermic with resultant decrease in entropy of the bulk solution. Results of SEM/**EDAX**, FTIR and UV-VIS studies support that a protective film forms 5-HTP and MS facilitated by O, N and C=C functionalities.

Keywords: 5-hydroxytryptophan; well acidizing; corrosion inhibitor; EIS; SEM/**EDAX**, acid corrosion.

1. Introduction

When existing wells deplete and their natural pressure declines, the use of chemistry to maintain production becomes very essential. This is achieved through well stimulation, fracturing, secondary and enhanced oil recovery operations. Well acidizing is a common field

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