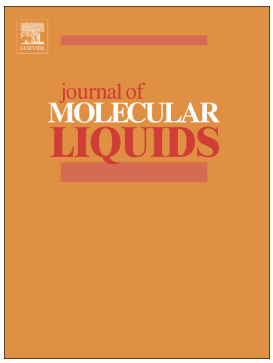

Electrochemical and quantum chemical evaluation of new bis(coumarins) derivatives as corrosion inhibitors for carbon steel corrosion in 0.5 M H2SO4

M. Abd El-Raouf, E.A. Khamis, Maram T.H. Abou Kana, Nabel A. Negm

PII: S0167-7322(17)35330-8
DOI: https://doi.org/10.1016/j.molliq.2018.01.148
Reference: MOLLIQ 8602

To appear in: *Journal of Molecular Liquids*

Received date: 8 November 2017
Revised date: 20 January 2018
Accepted date: 25 January 2018

Please cite this article as: M. Abd El-Raouf, E.A. Khamis, Maram T.H. Abou Kana, Nabel A. Negm , Electrochemical and quantum chemical evaluation of new bis(coumarins) derivatives as corrosion inhibitors for carbon steel corrosion in 0.5 M H2SO4. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Molliq(2017), https://doi.org/10.1016/j.molliq.2018.01.148

Electrochemical and quantum chemical evaluation of new bis(coumarins) derivatives as corrosion inhibitors for carbon steel corrosion in 0.5 M H_2SO_4

M. Abd El-Raouf[1#], E. A. Khamis[1], Maram T.H. Abou Kana[2], Nabel A. Negm[1]

1. Egyptian Petroleum Research Institute, Nasr city, Cairo, EGYPT.

2. National Institute of Laser Enhanced Sciences, Cairo University, Giza, EGYPT.

Corresponding author: M. Abd El-Raouf1, Egyptian Petroleum Research Institute, Nasr City, P.B. 11727, Cairo, EGYPT. Tel. :(+202) 22745902; fax: (+202) 22747433

E-mail address: abdelraouf1979@yahoo.com

Abstract

Four new bis(coumarin) compounds were prepared and their structures were confirmed using elemental analysis FTIR, ^{1}H-NMR and mass spectroscopy. The corrosion inhibition tendencies of the prepared compounds were investigated in inhibiting the carbon steel corrosion in 0.5 M H_2SO_4 using potentiodynamic polarization electrochemical impedance measurements and quantum chemical methods. The results showed that the prepared compounds are efficient and perform their action as mixed type corrosion inhibitors, and their corrosion inhibition tendencies were increased with the rising of their concentration and temperature of measurement. The adsorption of the prepared inhibitors on the carbon steel surface was chemisorption and obeyed Langmuir adsorption isotherm. The results of the quantum chemical calculations and the electrochemical measurements were in good agreement.

Keywords: Carbon steel; corrosion inhibition; EIS; quantum chemical calculations.

1. Introduction

The electrochemical properties of carbon steel are the subject of many investigations due to its wide applications in industry such as heat exchange of boiler systems, construction material for chemical reactors, storage tanks, oil and gas transport pipelines [1-4]. The protection of carbon steel against corrosion prevents the waste of both resources and cost during the industrial applications and also, it is vital for the extension of the lifetime of the