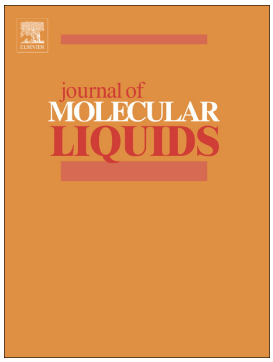

A novel thiophene Schiff base as an efficient corrosion inhibitor for mild steel in 1.0 M HCl: Electrochemical and quantum chemical studies

Fatih Tezcan, Gurbet Yerlikaya, Asad Mahmood, Gülfeza Kardaş

PII: S0167-7322(18)32546-7
DOI: doi:10.1016/j.molliq.2018.08.025
Reference: MOLLIQ 9470

To appear in: *Journal of Molecular Liquids*

Received date: 31 May 2018
Revised date: 31 July 2018
Accepted date: 6 August 2018

Please cite this article as: Fatih Tezcan, Gurbet Yerlikaya, Asad Mahmood, Gülfeza Kardaş , A novel thiophene Schiff base as an efficient corrosion inhibitor for mild steel in 1.0 M HCl: Electrochemical and quantum chemical studies. Molliq (2018), doi:10.1016/j.molliq.2018.08.025

A novel thiophene Schiff base as an efficient corrosion inhibitor for mild steel in 1.0 M HCl: Electrochemical and quantum chemical studies

Fatih Tezcan*, Gurbet Yerlikaya, Asad Mahmood, Gülfeza Kardaş

Çukurova University, Science and Letters Faculty, Chemistry Department, 01330, Adana, Turkey

Abstract

This study presents the synthesis, structural characterization, and inhibition efficiency of a new sulphur containing Schiff base (4-((thiophene-2-ylmethylene)amino)benzamide) (4-TAB) on mild steel in 1.0 M HCl solution. The inhibition efficiency of the 4-TAB is analysed by using electrochemical analysis, solution assay analysis, and theoretical calculation. Electrochemical impedance spectroscopy and linear polarization resistance results show the highest inhibitor efficiency of 96.8% and 96.5%, respectively. The potentiodynamic polarization measurements indicate a decreasing corrosion rate from 9.104 to 0.481 mm year^{-1} by addition of 4-TAB. Theoretical calculations are performed using the density functional theory to further confirm and compare our experimental results.

***Keywords**:* Mild steel; Schiff base; EIS; Polarization; ICP-OES; DFT.

*Corresponding Author: Tel: +90 322 3386418, Fax: +90 322 3386070,

email: fatihtezcan3935@gmail.com

1. Introduction

The corrosion of mild steel in numerous industrial operations is a severe problem that must be addressed and prioritized for economic purposes as well as for machine durability. The utilization of mild steel in many cleaning processes such as pickling, industrial acid cleaning, acid descaling, and oil wells is highly susceptible to corrosion, particularly in acidic environments. In a significant number of these operations, hydrochloric acid is used due to low-cost, ease of use, and efficiency as opposed to mineral acids. However, owing to the