Experimental and Theoretical Evaluation of Asymmetric Thioureas on the Corrosion of Carbon Steel in Acidic Medium

Arthur Valbon¹, Marcelo. A. Neves², Aurea Echevarria¹,*

¹ Departamento de Química, Instituto de Ciências Exatas, Universidade Federal Rural do Rio de Janeiro, 23890-000, Seropédica – Rio de Janeiro, Brasil
² Departamento de Física, Instituto de Ciências Exatas, Universidade Federal Rural do Rio de Janeiro, 23890-000, Seropédica – Rio de Janeiro, Brasil
*E-mail: echevarr@ufrrj.br

doi: 10.20964/2017.04.55

Received: 25 January 2017 / Accepted: 23 February 2017 / Published: 12 March 2017

The inhibitory effects of $N$-(p-X-phenyl)-$N'$-benzyl-thiourea (THIOB1 and THIOB2) and $N$-(p-X-phenyl)-$N'$-phenethyl-thiourea (THIOF1 and THIOF2) on the corrosion of AISI 1020 carbon steel in 1 mol L$^{-1}$ HCl were evaluated by polarization curves (PP), Linear Polarization Resistance (LPR), Electrochemical Impedance Spectroscopy (EIS) and molecular modeling. The corrosion inhibition efficiency of phenethyl-thioureas slightly exceeded that observed for benzyl-thioureas; also, all thioureas acted as mixed inhibitors. 98% was the maximum anticorrosion efficiency for THIOF2, obtained by LPR. The adsorption of the evaluated inhibitors followed Langmuir isotherm. Theoretical results were corroborated by experimental data that showed phenethyl-thioureas were slightly better corrosion inhibitors than benzyl-thioureas.

Keywords: Carbon steel, Polarization, EIS, Modeling studies, Acid corrosion

FULL TEXT

© 2017 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).