Inorganic Chemistry Communications
Volume 162, April 2024, 112189

Preparation and identification of a novel 1,1′-(1,4-phenylenebis (methylene) bis (4-cyanopyridin-1-ium) bromide as a corrosion inhibitor for C1018 in highly acidic media

Zaidoun K. Kuraimid [a], Abd El-Aziz S. Fouda [a], S. Mohammad Sajadi [c], Dawood S. Abid [b], A.M. Wahba [e], Dheyaa J. Jasim [d], Soheil Salahshour [f g h]

Abstract

1,1′-(1,4-phenylene-bis (methylene)) bis(4-cyanopyridin-1-ium) bromide (PCB) was synthesized and identified via spectral methods: Fourier-transform infrared (FTIR) spectroscopy, proton nuclear magnetic resonance hydrogen (^{1}HNMR), and proton nuclear magnetic resonance carbon (^{13}CNMR). The inhibitory effect (% IE) was determined using weight loss (WL) method, potentiodynamic polarization (PDP) and electrochemical impedance spectroscopy (EIS) techniques for the corrosion of C1018 in strong (6M) HCl. % IE reached 98.9% at 200mg/L, 313K. The effects of the PCB concentration, HCl concentration, and temperature on the corrosion rate of C1018 were then confirmed using WL. The PDP curves indicate that PCB acts as mixed type-inhibitor. The adsorption of PCB obeyed the Langmuir adsorption isotherm. The adsorption of PCB on C1018 revealed that the adsorption process exhibiting physical and chemical adsorption. Theoretical modeling revealed the correlation between the QAS molecular chemical structure and its anticorrosive property. All the experimental and theoretical calculations were in good agreement.