World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Electrochemical and Theoretical Quantum Approaches on the Inhibition of C1018 Carbon Steel Corrosion in Acidic Medium Containing Chloride Using Newly Synthesized Phenolic Schiff Bases Compounds

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Abstract : Two novel Schiff bases, 5-bromo-2-[(E)-(pyridin-3-ylimino) methyl] phenol (HBSAP) and 5-bromo-2-[(E)-(quinolin-8-ylimino) methyl] phenol (HBSAQ) have been synthesized. They have been characterized by elemental analysis and spectroscopic techniques (UV–Vis, IR and NMR). Moreover, the molecular structure of HBSAP and HBSAQ compounds are determined by single crystal X-ray diffraction technique. The inhibition activity of HBSAP and HBSAQ for carbon steel in 3.5 %NaCl+0.1 M HCl for both short and long immersion time, at different temperatures (20-50 ºC), was investigated using electrochemistry and surface characterization. The potentiodynamic polarization shows that the inhibitors molecule is more adsorbed on the cathodic sites. Its efficiency increases with increasing inhibitor concentrations (92.8 % at the optimal concentration of 10-3 M for HBSAQ). Adsorption of the inhibitors on the carbon steel surface was found to obey Langmuir's adsorption isotherm with physical/chemical nature of the adsorption, as it is shown also by scanning electron microscopy. Further, the electronic structural calculations using quantum chemical methods were found to be in a good agreement with the results of the experimental studies.

Keywords : carbon steel, Schiff bases, corrosion inhibition, SEM, electrochemical techniques
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020