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

Authors : Hany M. Abd El-Lateef

Abstract : Two novel Schiff bases, 5-bromo-2-[(E)-(pyridin-3-ylimino) methyl] phenol (HBSAP) and 5-bromo-2-[(E)-(quinolin-8ylimino) 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 °C), 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

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