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Electrochemical Study on the Affectivity of Omeprazole Drug as an Inhibitor for Corrosion of High Carbon Steel in 1M HCl

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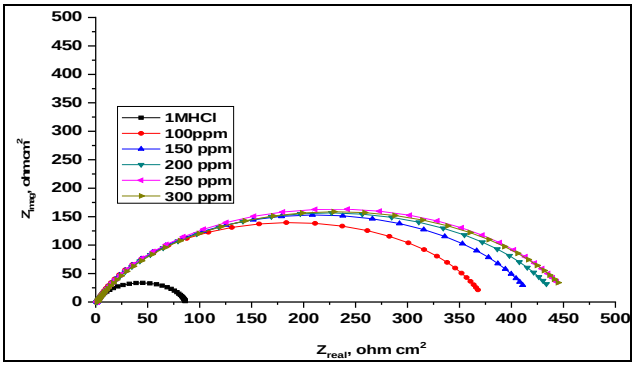
ABSTRACT

A pharmaceutically active compound of Omeprazole (OME) is a proton pump inhibitor drug that protect stomach acid discharge. OME was investigated as organic corrosion inhibitor for high carbon steel (HCS) in 1 M HCl utilizing electrochemical impedance spectroscopy (EIS), potentiodynamic polarization (PP), electrochemical frequency modulation (EFM) and mass loss methods. The impact of EIS displayed the increase in the polarization resistance (R_P) and the decline in the double layer capacitance (C_{dl}). Polarization data demonstrated that, this OME goes about as mixed-type inhibitor. Inhibition efficiency was dependent on doses of OME and temperature. The adsorption of this extract on the outside of HCS from the damaging corrosive medium has been found to obey Langmuir adsorption isotherm. The thermodynamic parameters of HCS consumption in 1M HCl were computed and discussed. The AFM examination of the HCS surface indicated that the concentrate avoided consumption by adsorption on its surfaces and reduced the roughness. FTIR results showed that the inhibition mechanism was by adsorption process, through the functional groups present in the drug component. Results obtained indicate the potential utilization of this drug as corrosion inhibitor for HCS in acidic media.

Graphical Abstract



Nyquist plots without and with altered OME concentrations for HCS dissolution in corrosive solution

Keywords: Acidic inhibition, High Carbon steel (HCS), Omeprazole (OME), EFM, EIS.