**Abstract**

Acid solutions are widely used in industry, some important field of application being acid pickling, industrial cleaning, acid descaling, petrochemical processes etc. The majority of the corrosion inhibitors employed during production of steel form thin barrier layers between the steel surface and the corroding fluid. It was found that the formation of donor-acceptor surface complex between free or π-electrons of an organic inhibitor and vacant d-orbital of a metal is responsible for the inhibition of corrosion process. In the present study, Imidazoline derivative synthesized by conventional and microwave method is investigated for its anti-corrosion potential against mild steel in 1M HCl and 0.5M H2SO4 solution using electrochemical impedance spectroscopy, Potentiodyamic polarization and quantum chemical studies.

Synthesized inhibitor is characterised by FTIR Spectra, DLS and SEM. The inhibition efficiency was evaluated at different concentrations of the inhibitor. The present investigation is carried out to find whether the greater inhibition efficiency for inhibitor synthesized by microwave method than conventional method. Electrochemical impedance spectroscopy: Nyquist plots for mild steel in 1M HCl and 0.5M H2SO4 with and without inhibitor results in increase in Rct values and decrease in Cdl shows the formation of the protective film of the inhibitor on the metal increases the efficiency of the inhibitor. The maximum inhibition efficiency of the inhibitor 98% and 79% at 20 ppm in HCl and H2SO4 synthesized by microwave method and by conventional method it shows the maximum efficiency of 89% and 70% respectively. From the Polarisation Measurements the Tafel constants obtained from the potentiodynamic polarisation curves indicate that the investigated compound was mixed type inhibitor. Molecular modelling has been conducted to correlate the corrosion inhibition properties with the calculated quantum chemical parameters. Quantum chemical parameters were studied by DFT BLYP 6-31G (d,p) basis set. The energy of the HOMO (EHOMO) provides information about the tendency of the molecule to donate electrons to an electron poor species. The higher the (EHOMO) is the greater tendency of a molecule to donate its electrons to the electron poor species. Therefore the studied compound provides an indication that it would have highest tendency to donate its electrons to the metal surface and therefore bind strongly to the metal surface. Adsorption sites is mainly over the Nitrogen atoms.