ABSTRACT

Corrosion processes are accountable for loss of lives and economic implications in the industrial sectors. It is tedious to get rid of it completely, but the best way to tackle this is prevention. To prevent this, the usage of corrosion inhibitor is one of the most convenient method to protect the metal from corrosion. This social, economic stress has paved a platform to identify the research problem.

The present thesis is focused on investigating corrosion mitigation performance of natural and synthetic inhibitors on protecting the metal surface in different electrolytes. To begin with, the acid and ethanol extracts of natural inhibitors were prepared and characterised by GC-MS, FT-IR and UV-Visible spectral studies. The methodologies that have been adopted and employed for investigations are non-electrochemical and electrochemical methods. To understand the corrosion process and formation of adherent layer on the metal, surface morphology of the metal plates was analysed by XRD, XPS, SEM-EDS and AFM. Quantum chemical calculations were performed for selected inhibitors by DFT to substantiate experimental data.

Microwave irradiation method was adopted to synthesise sulphamethazine derivatives and structure was characterized by ^{1}H-NMR, ^{13}C-NMR, FT-IR and mass spectral techniques. The anti-corrosion properties of synthetic inhibitors were investigated by mass loss method, impedance and polarization studies. The methods adopted were in good agreement with each other. To strengthen the results techniques such as XRD, XPS, SEM-EDS and AFM were carried out. Furthermore, theoretical analysis carried out by DFT correlated well with experimental values.

The corrosion inhibition performance of selected natural and synthetic inhibitors in chloride induced environment was analysed by electrochemical studies and surface techniques.

To enhance the corrosion resistance of epoxy resin, natural inhibitor was incorporated into the clay, dispersed in epoxy resin, applied on mild steel surface and the experiment was performed in alkaline and acid environment. Surface and elemental composition was evaluated by SEM-EDS.

The corrosion degradation behaviour of Ti-6Al-4V alloy in simulated body fluid in the presence of selected natural inhibitors was monitored by electrochemical techniques and surface morphologies by Scanning electron microscopy- Energy dispersive X-ray spectroscopy and Atomic force microscopy. Various corrosion parameters proved that natural and synthetic inhibitors are effective in mitigating corrosion in different metals and electrolyte.