PREFACE

Corrosion is a gradual destruction of materials (usually metals) by chemical and/or electrochemical reaction with their environment. Corrosion causes numerous failures and enormous loses in a number of industries. Failures resulting from inability of metal to support the designed load requirement due to loss of metal caused by corrosion effect can be controlled economically using the chemical inhibitors. Besides the effectiveness, most of the chemical inhibitors are associated with toxicity, disposal and enormous cost. The present research work has been focused on Synthesis of Heterocyclic compounds as acidizing corrosion inhibitors for carbon steel in 15% hydrochloric acid. The thesis is divided into five chapters.

Chapter 1 deals with the introduction of corrosion, highlighting the definition of corrosion, Economic importance of corrosion, Different form of corrosion, Methods of Corrosion Control, theory and mechanism of corrosion principles. Aim and objectives of the research have been elaborated.

Chapter 2 focuses on the literature survey relevant to corrosion of carbon steel (N-80 Steel and mild steel) in the acid environment, along with the general introduction of corrosion inhibitors: definition, types and mechanism. Chapter 3 deals with the materials and methods details including materials, synthesis of organic inhibitors, sample preparation, chemicals and methods adopted such weight loss, electrochemical impedance spectroscopy (EIS), potentiodynamic polarization (PDP), surface analysis (SEM/EDX/AFM /FTIR) and computational simulations.

(quantum chemical calculations and molecular dynamic) for the evaluation of corrosion inhibition property have been described.

Chapter 4 deals with the results and discussion on corrosion inhibition of N-80 steel and mild steel in 15% hydrochloric acid by four series of inhibitors: Substituted Triazines (TZs) derivatives (Series I), Chromeno Naphthyridines (CNs) derivatives (Series II), Quinolines (AHQs) (Series III) and Benzimidazole based corrosion inhibitors (Series IV) using weight loss (WL), electrochemical impedance spectroscopy (EIS) and potentiodynamic polarization (PDP). The inhibited and uninhibited metal surface was characterized using the scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDX), atomic force microscopy (AFM), Fourier-transform infrared Spectroscopy-Attenuated total reflection- (FTIR-ATR) and UV–vis spectroscopy. The theoretical studies: quantum chemical calculation and molecular dynamics simulation were used to obtain insights in the inhibition mechanism of the inhibitor molecules on the metal surface.

A plausible mechanism of corrosion inhibition has been proposed on the basis of experimentally and theoretically obtained results.

Chapter 5 provides general summary, conclusions and suggests future work.