The Corrosion Behaviour of a Pyrazoline Derivative on Mild Steel in Hydrochloric Acid Medium: Electrochemical and Quantum Chemical Investigation

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1 Introduction

Most of the industries use iron and its alloys due to its magnificent physical, mechanical and other properties [1]. The harsh environment of the petrochemical industries can be endured by mild steel, an important alloy of iron. The corrosion of iron and its alloy is a global issue that affects the overall GDP of a nation. One feasible method to reduce the corrosion rate is to employ organic compounds as corrosion inhibitors [2]. These compounds preferably block redox reactions and are involved in the corrosion process. The organic compounds containing heterocycles, conjugated systems and heteroatoms participate in the donor–acceptor interaction between the metal and the inhibitor, thereby reducing the rate of metal dissolution [3]. Among the various heterocyclic organic compounds, pyrazoline derivatives are proven to be efficient organic inhibitors. These molecules are known to play multiple roles such as antimicrobial, antitubercular, anticancer and antifungal agents. Apart from possessing medicinal applications, the pyrazoline derivatives are also used as anticorrosive agents for iron, mild steel, copper and aluminium [4]. The present work involves the investigation of N-methyl-5-(4-methyl phenyl)-3-phenyl-4,5-dihydro-1H-pyrazole-1-carbothioamide (MPPC) as a corrosion inhibitor for mild steel in 0.5 M HCl. The electrochemical analysis is carried out by using electrochemical impedance spectroscopy and potentiodynamic studies. The surface analysis

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