UNIVERSITI TEKNOLOGI MARA

SYNTHESIS AND CHARACTERIZATION OF AROMATIC IMINE DERIVATIVES AS CORROSION INHIBITORS ON MILD STEEL IN 1M HYDROCHLORIC ACID

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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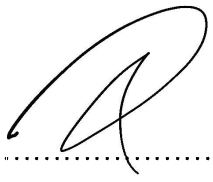
Signature of Student	:	
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ABSTRACT

Azomethine compound, which is identified by the presence of imine, (C=N). The structure of azomethine compound which has electron-rich on the C=N has been found to give good potential in chemical interaction including complexation with metal. This study provides a detailed synthesis process using condensation method and inhibition performance of azomethine on mild steel through electrochemical studies including electrochemical impedance (EIS) and potentiodynamic polarization measurement at room temperature. The structure of synthesized products was elucidated via elemental analysis (CHNS), nuclear magnetic resonance (NMR), infrared spectroscopy (IR), and single-crystal X-ray diffraction. The synthesized azomethine compounds (A1-H, A2-F, A3-CH_3, A4-NO_2) have proven to give high inhibition efficiency in 1M HCl solution at room temperature in the range between 60-95 (IE%). Based on the EIS and potentiodynamic polarization, A2-F inhibitor was found to give the highest inhibition efficiency as a mixed type inhibitor. The presence of fluoro, F promotes electron delocalization in the azomethine compound which improve the inhibition efficiency. The performance of A1-H and A2-F inhibitors were further analyzed using quantum chemical study. The inhibition mechanism of the synthesized azomethines was proved to obey Langmuir adsorption isotherm. Based on the Gibb's free energy, ΔG_{ads} the azomethine inhibitors were considered as mixed type adsorption which is a combination between chemisorbed and physisorbed on to the metal surface. Based on the density-functional theory study (DFT), A2-F inhibitor has shown to give better inhibition efficiency due to strong solubility in water compared to A1-H inhibitor. The presence of fluorine also causes the frontier orbitals of HOMO more delocalized on A2-F opposed to A1-H. The findings were supported with further investigation based on the elemental composition analysis of metal solution interface using X-ray photoelectron spectroscopy (XPS). Based on the XPS analysis, the adsorption of A2-F inhibitor on mild steel surface has been proved mostly via chemisorption from carbon as found in the benzene ring and physisorbed via nitrogen in $C=N^+$. The mild steel surface was further analyzed to study surface morphological using scanning electron microscope (SEM) and atomic force microscope (AFM). A2-F inhibitor shows the most improved surface on both SEM and AFM compared to the untreated mild steel in 1M HCl.

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