SYNTHESIS, CHARACTERISATION AND CORROSION INHIBITION STUDY OF FORMALDEHYDE AND 2-BENZOYLPYRIDINE THIOSEMICARBAZONE LIGANDS IN ACIDIC AND ALKALINE MEDIA

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ABSTRACT

SYNTHESIS, CHARACTERISATION AND CORROSION INHIBITION STUDY OF FORMALDEHYDE AND 2-BENZOYLPYRIDINE THIOSEMICARBAZONE LIGANDS IN ACIDIC AND ALKALINE MEDIA

The universal usage of metal in the industrial and domestic applications could lead to corrosion due to the degradation of the metal surface. The corrosion process may occur in the acid and alkaline media. Corrosion inhibitor is suggested to be the most effective method that can be used to protect the metal against the corrosion. Thiosemicarbazone ligand is used as a corrosion inhibitor due to the presence of nitrogen and sulphur atom in their structure. The synthesized ligands that undergo reflux method were formaldehyde 1-acetyl-3-thiosemicarbazone (FATSC) and 2-benzoylpyridine 1-acetyl-3-thiosemicarbazone (BPATSC). The ligands were characterised by using melting point analysis, Fourier Transform Infrared (FTIR), Ultraviolet-Visible (UV-Vis) and Nuclear Magnetic Resonance (NMR) spectroscopies. The melting point for FATSC and BPATSC are between 148-150 °C and 164-167 °C respectively. For IR analysis, a new stretching band of *ν*(C=N) appeared in both ligands indicated that the ligands are successfully synthesized. The absence of *ν*(C-S) indicated that the ligands are found in a thione form. The UV-Vis analysis showed a $\pi \rightarrow \pi^*$ transitions of carbonyl, thione and imine group for FATSC, while the group of carbonyl, thione, imine and aromatic ring for BPATSC. The $n \rightarrow \sigma^*$ electronic transition in BPATSC indicate the presence of electronegative atom such as nitrogen, oxygen and sulphur. As for the NMR analysis, the chemical shift derived from the ^{1}H NMR data obeyed the confirmation of hydrogen in the synthesised ligands. In the ^{13}C NMR spectra, the ligands found to be in a form of thione tautomer due to the presence of C=S peak at 182.90 ppm (FATSC) and 182.35 ppm (BPATSC). The positive effectiveness towards corrosion inhibition showed that the ligands are good corrosion inhibitor in both acidic and alkaline media. In acidic media, corrosion inhibition in 1 M HCl are more effective than in 1 M H_2SO_4 since H^+ concentration in H_2SO_4 is higher which make it more corrosive. The efficiency of corrosion inhibitor is lower in 1 M NaOH compared to 1 M KOH because K^+ is more electropositive than Na^+, which K^+ has higher ionic radius that reduce the corrosion rate more compared to Na^+. BPATSC shows higher effectiveness as a corrosion inhibitor compared to FATSC. This is due to the presence of pyridine that activates the aromatic ring to increase the adsorption of the inhibitor onto the metal surface and reduce the corrosion rate. As a conclusion, the higher the concentration of inhibitor used, the higher its effectiveness towards corrosion inhibition.