

**SYNTHESIS, CHARACTERIZATION AND ANTI-CORROSION
SCREENING OF Cu(II) AND Ag(I) 4-ACETYLPIRIDINE
4-ETHYL-3-THIOSEMICARBAZONES COMPLEXES**

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This Final Year Project Report entitled “**Synthesis, Characterization and Anti-Corrosion Screening of Cu(II) and Ag(I) 4-Acetylpyridine 4-Ethyl-3-Thiosemicarbazones Complexes**” was submitted by Nur Nadira Hazani, in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Chemistry, in the Faculty of Applied Sciences, and was approved by

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ABSTRACT

SYNTHESIS, CHARACTERIZATION AND ANTI-CORROSION SCREENING OF Cu(II) AND Ag(I) 4-ACETILPYRIDINE 4-ETHYL-3-THIOSEMICARBAZONES COMPLEXES

4-acetylpyridine 4-ethyl-3-thiosemicarbazone [4Acpy4E3TSC], Cu(II) and Ag(I) complexes were successfully synthesized by condensation method. The compounds were characterized by elemental analysis, FT-IR, UV-Vis, gravimetric analysis, molar conductivity, X-ray crystallographic study and melting point. The results of the elemental analysis for the compound were in good agreement with the theoretical value. The melting points of the complexes were higher than ligand, as expected. The FT-IR spectral data implied a bidentate bonding of 4Acpy4E3TSC to Cu(II) and Ag(I) ion through azomethine nitrogen and thiocarbonyl sulfur. The UV-Vis analysis showed two types of transition, which are $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ in ligand and complexes. The spectra of complexes shifting from ligand spectral proved the coordination to metal ions. UV-Vis spectral are showed that the Cu(II) complex undergo $d-d$ transitions as can be seen from the presence of bands > 400 nm in UV-Vis spectral. The molar conductivity showed the Cu(II) complex was 1:1 electrolyte with formula $[\text{Cu}(\text{4Acpy4E3TSC})(\text{3H}_2\text{O})\text{Cl}]\text{Cl}$ and Ag(I) complex was non-electrolyte with formula $\text{Ag}(\text{4Acpy4E3TSC})(\text{6H}_2\text{O})$. The gravimetric analysis showed the percentage of Cu(II) was 12.60 % and the percentage of Ag(I) was 26.48 %. The 4Acpy4E3TSC ligand was successfully produced single crystal that suitable for the X-ray crystallographic studies. X-ray crystallographic structures for 4Acpy4E3TSC showed that ligand is in the solid state, the compound existed in the thione form. 4Acpy4E3TSC adopted monoclinic system, $a = 10.5922(7)$, $b = 8.9597(6)$, $c = 13.0407 \text{ \AA}$, $\alpha = 90$, $\beta = 106.025(2)$, and $\delta = 90^\circ$ and $Z = 4$. The corrosion inhibition study showed that the inhibition efficiency increases in the sequence [copper(II) complex] $>$ ligand $>$ [silver(I) complex]. The inhibitor efficiency tend to increase as inhibitor concentration increase.