UNIVERSITI TEKNOLOGI MARA

DEVELOPMENT OF PALM OLEIN AS A CORROSION INHIBITOR FOR ALUMINIUM ALLOY

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ABSTRACT

Aluminium (Al) is an amazing material due to its low cost, lightweight and corrosion resistance. However, Al is easily corroded when exposed in solution containing pitting agents. Suitable corrosion inhibitor should be used and palm olein has a promising characteristics. For this work, formulation of palm olein (PO) as corrosion inhibitor for Al in aqueous solution was developed. Tween 20, hexane and diethyl triamine were used as the additives and the formulated inhibitor was labeled as POT20HA. The X-ray diffractometer (XRD) spectrum revealed that the POT20HA was an amide compound. The inhibition efficiency (IE) and behaviour of the POT20HA were determined through weight loss (WL), potentiodynamic polarization (PP) and electrochemical impedance spectroscopy (EIS). For the tests, Al 6061 was immersed in 1 M HCl solution at different temperatures of 26°C (299 K), 50°C (323 K) and 70°C (343 K) with different concentrations of POT20HA of 0, 0.03, 0.07, 0.10, 0.13 and 0.17 M. Scanning Electron Microscopy (SEM) coupled with Energy Dispersion X-ray analysis (EDAX) was used to examine the morphology of the corroded Al 6061. The WL test had shown that the IE increased with increasing concentration of POT20HA at all temperatures under study. However, the IE decreased with increasing of temperature and immersion time. The PP study revealed the POT20HA as a mixed type of inhibitor, which is capable of protecting both the anodic and cathodic reactions of the corrosion process. The EIS study had shown the ability of POT20HA in forming protective passive film on Al 6061 surface. The thickness of the passive film increased accordingly with the increase in concentration but decreased with increasing temperature. The corrosion tests showed that POT20HA adsorbed on the Al 6061 surface through physical adsorption according to the Langmuir isotherm relationship. The adsorption mechanism of POT20HA on the Al 6061 was through protonation of micelles by the HCl solution. The protonated micelles, with the presence of Cl^- ions, adsorbed both on the cathodic and anodic sides of the corroding surface. Performance test had shown that the POT20HA has performed as an anticorrosion with glycerin as a coolant in an Al car radiator.

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