

Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu in fulfillment of the requirement for the degree of Master of Science

**PERFORMANCE OF HENNA EXTRACT AS A CORROSION INHIBITOR
FOR ALUMINIUM ALLOY IN MARINE APPLICATION
HAJAR HAKIMAH BINTI MARZALAN**

July 2017

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Corrosion is a problem that commonly occurs in industry. It was a serious problem that led to the failure of an object especially to the metallic structures. Due to this problem, researchers have been focusing on the corrosion prevention methods. The implementations of new compounds in paint system have gained the attention among researchers. In this approach, henna leaves extract had been incorporated into a paint matrix and was utilized to reduce environmental damage. Henna was identified as an excellent corrosion inhibitor and due to this reason, a research on henna extracts was conducted in order to investigate the ability of henna extract to act as an anti-corrosive agent with a compatible composition in the paint system. The paint composition contains WW rosin as binder (17.1%) and Oleic acid as plasticizer (2.9%). Calcium carbonate as pigment (14.1%) and xylene/white spirit mixture with the ratio of 1:1 (22.0%) as solvent. Zinc oxide (ZnO) and henna leaves extract were used as additives for this paint formulation and their value were manipulated from 43.9% to 23.9% for (ZnO) and 0% to 20% for henna leaves extract. The paint compositions were calculated by weight percentage. In order to measure the effectiveness of the new paint system,

several tests were conducted to investigate the inhibitive properties of henna extract including fourier transform infrared spectroscopy, x-ray diffraction, weight loss measurement, potentiodynamic polarization and electrochemical impedance spectroscopy. In addition, the morphology profile of the coated substrates had been validated using scanning electron microscopy and infrared thermal imaging technique. The presence of phenolic and carbonyl group from the henna extracts in the paint system has contributed to higher inhibition efficiency and also help in reducing weight loss of aluminium metal. Based on the findings, aluminium alloy coated with paint containing 8% of henna extract (P3) shows the highest corrosion inhibition effect compared to other paints. As an evident, weight loss measurement (inhibition efficiency: 77.75%) and electrochemical impedance spectroscopy analysis (inhibition efficiency: 99.87%) for P3 were recorded. Thus, P3 acts as an optimum paint by referring to its performance on the corrosion inhibition efficiency. The values of inhibition efficiency decrease after incorporation of 10% of henna extract into paint matrix (P4). The addition of henna extract into paint matrix up to 8% shows a great performance as a corrosion inhibitor with a right brewed procedure.