Banana Peel as Green Corrosion Inhibitor for Stainless Steel 304

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Abstract
Corrosion is commonly known as rust, an undesirable phenomena which destroys the appearance and beauty of objects and cause shorter of life span [1]. The objective for this research is to study the effect of using green inhibitor with seawater (3.5% NaCl) to the corrosion resistance of stainless steel 304 (SS304). The green inhibitor was extracted from banana peel and the concentration varies from 5% to 25%. The test was conducted using the 3-electrode potentiostat at ambient temperature under static conditions. The results elucidate that green inhibitor has significant effect to the breakdown of passive film of SS304 in seawater. The forms of corrosion attack viewed reveal the effect of inhibitor to breakdown potential $E_b$ of SS304.

Experimental Method
The electrochemical analysis was identified using Potentiostat/galvanostat in conjunction with three electrodes. The solutions (electrolyte) also were prepared with different concentrations of inhibitor with 3.5% NaCl and $E_b$ value was identified in anodic scan at ambient temperature. For cyclic polarisation potential (CPP) measurement, after the current density reaches a preset value of $500 \mu A/cm^2$, the potential then gradually returns to the open circuit potential [1]. For immersion test, the $E_b$ was identified after 2,3,4,6 and 8 weeks immersion.

Result and Discussion
The FTIR was used to quantitative characterized of tannin in banana peels and reveals that condensed tannins are based on the flavan-3-ols functional groups. Fig. 1 presents the FTIR results for inhibitor.

![FTIR spectrum of tannin extracted from banana peel](image1)

Fig.1: FTIR spectrum of tannin extracted from banana peel

Effect on Immersion Sample
The CPP of immersion SS304 is shown in Fig. 2. immersion time increased and gradually decreased after 6 weeks; suggesting that this is the critical time where passive metal oxide is not repassivate and SS304 is exposed for pitting corrosion. The microscopy reveals some pitting observed as compared to non immersion sample.

![Microscopy of pitting corrosion](image2)

(a)
THE SS304 IN GREEN INHIBITOR

The $E_b$ of SS304 was identified in different concentrations of inhibitor. In Fig. 3 presents the CPP of SS304 in seawater added with inhibitor. As the concentration increased, the OCP reduced and $E_b$ increased. This indicates that increasing the inhibitor concentrations in 3.5%NaCl solution will protect the metal from corrosion attack. The surface microstructure of corrosion attack reveals that number of pitting reduced as the concentration of inhibitor was increased.

Conclusion

The green inhibitor extracted from banana peel increased corrosion resistance of SS304 in ambient environment. The inhibition action is performed by the adsorption of the extract compounds on the steel surface. The result of this research could bring more exposure to the industrial sector which is it can reduce the cost due to the maintenance, wasted energy resources and increased the production of the fabrication.

REFERENCES
