論 文 内 容 の 要 旨

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Corrosion is a serious problem faced that cost many industries billions of dollars. Corrosion inhibitors were thus developed to overcome the corrosion problem. The leaf of an agarwood producing tree (*Aquilaria malaccensis*) was extracted and studied as corrosion inhibitors for mild steel in HCl solution. The chemical content of the extract was studied using a Quadruple time-of-flight liquid chromatography mass spectrometer (Q-TOF LC/MS) and Fourier transform infra-red spectrometer. Adenosine was discovered to be one of the compound existing in the extract. The anti-corrosion behavior of the leaf extract and adenosine were studied using the weight loss method, electrochemical impedance spectroscopy (EIS) and potentiodynamic polarization measurement and both the extract and adenosine were found to be excellent corrosion inhibitors for mild steel in HCl solution. Adenosine was also studied using the Electrochemical quartz crystal microbalance (EQCM) measurement and the corrosion inhibition mechanism of adenosine was discussed.

In chapter 1, the overview of the corrosion process and the problems were shown and the usage of corrosion inhibitors was introduced. Mild steel and the agarwood leaf sample used was also introduced. Along with these, the anti-corrosion, chemical analyses and surface morphology analyses was also included in this chapter. Finally, the purpose of the thesis was shown.

In chapter 2, the materials, instruments and experimental methods for this study were introduced.

In chapter 3, the anti-corrosion behavior of the *Aquilaria malaccensis* leaf extract was studied using the weight loss measurement, EIS and potentiodynamic polarization method. The leaf extract was found to inhibit corrosion up to over 90 % at the concentration of 1500 ppm. The data obtained from the anti-corrosion analysis was fitted into the Langmuir adsorption isotherm model and the leaf was found to adsorb by a mix-type mechanism.

In chapter 4, the leaf extract content analysis was shown. From the Q-TOF LC/ MS study, there were five compounds discovered including adenosine. The FTIR study revealed that the extract had desirable functional groups that could possibly contribute to the good corrosion inhibition activity of the leaf extract.

In chapter 5, the anti-corrosion behavior of adenosine was studied using the weight loss method and then the stagnant and hydrodynamic electrochemical methods. It was found that adenosine was an excellent inhibitor with over 70 % inhibition efficiency at the concentration of 1×10^{3} M in stagnant condition. Adenosine was found to not inhibit corrosion efficiently in the hydrodynamic solution. The data obtained from the anti-corrosion analysis were fitted into the Langmuir adsorption isotherm model and adenosine was found to adsorb by the mixed-type adsorption mechanism.

In chapter 6, the surface morphology of the corrosion of mild steel immersed in the HCl solution with and without the extract or adenosine was shown using the laser scanning microscope (LSM). The presence of the extract or adenosine improved the surface as it was smoother than the mild steel immersed without the inhibitors. Quantum chemical calculations was performed for adenosine to attempt the explanation of the adsorption of the adenosine on the surface of the mild steel for the anti-corrosion activity. The EQCM study was also shown to support the proposed mechanism of the adsorption of adenosine on the surface of the mild steel.

In chapter 7, the thesis was concluded.