# Sintesis Inhibitor Korosi dari Minyak Goreng Sawit dan TETA untuk Baja Rendah Karbon pada Lingkungan NaCl 1,5% = Synthesis of Corrosion Inhibitors from Palm Cooking Oil and TETA for Low Carbon Steel in 1.5% NaCl Environments

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Abstrak

Baja rendah karbon merupakan bahan konstruksi utama pada industri minyak dan gas. Namun, bahan ini bersifat sangat rentan terhadap korosi. Pada penelitian ini, telah dilakukan sintesis inhibitor korosi TETA-MGS (trietilentetramin-minyak goreng sawit) dengan metode refluks selama 14 jam. Temperatur divariasikan pada 130, 140, 150, dan 160â°C, dan kecepatan pengadukan pada 700, 1000, dan 1200 rpm. Diperoleh kondisi reaksi optimum dari titrasi penentuan angka penyabunan, yaitu pada temperatur 150â°C, kecepatan pengadukan 1200 rpm, dan waktu reaksi 14 jam. Produk sintesis TETA-MGS A dimurnikan, sehingga didapatkan TETA-MGS B. TETA-MGS B kemudian diidentifikasi dengan KLT, dikarakterisasi dengan spektrofotometri UV-visibel, spektroskopi FTIR dan LC-MS. Identifikasi dengan KLT menunjukkan bahwa TETA-MGS B bersifat cukup polar seperti prekursor trietilentetraminnya. TETA-MGS B memberikan serapan maksimum pada 204 nm untuk spektrum UV-visibelnya dan memiliki gugus-gugus kromofor yang sama dengan minyak goreng sawit dan trietilentetramin. Spektrum FTIR TETA-MGS B menunjukkan adanya tumpang tindih senyawa-senyawa TETA-MGS B. Pada LC-MS, diketahui bahwa TETA-MGS B dari sintesis pada 150â°C, 1200 rpm, dan selama 14 jam bukan senyawa imidazolin, melainkan masih berupa intermediet amidanya. Senyawa imidazolin baru diperoleh pada temperatur sintesis 160â°C. Pengujian efisiensi inhibisi korosi dilakukan dengan metode gravimetri dan elektrokimia menggunakan TETA-MGS A dan B dari sintesis pada 150â°C, 1200 rpm, dan selama 14 jam. Konsentrasi divariasikan pada 0, 5, 20, 50, dan 100 ppm. Pengujian dilakukan untuk baja rendah karbon JIS G3123 grade SGD 400D pada media korosi berupa larutan NaCl 1,5% yang telah dialirkan gas CO2. Efisiensi tertinggi diperoleh pada konsentrasi 100 ppm dan nilainya 62,12 dan 93,52% untuk TETA-MGS A dan B masing-masing. Hasil SEM-EDX mendukung efisiensi tinggi TETA-MGS B. Tipe korosi yang terjadi adalah korosi pitting. Adsorpsi TETA-MGS B pada permukaan baja merupakan fisisorpsi kuat dan sesuai dengan model isoterm Langmuir.

.....Low carbon steel is the main construction material in the oil and gas industry. However, this material is highly susceptible to corrosion. In this research, the synthesis of the corrosion inhibitor TETA-PCO (triethylenetetramin-palm cooking oil) was carried out using the reflux method for 14 hours. The temperature was varied at 130, 140, 150 and 160â°C, and the stirring speed at 700, 1000 and 1200 rpm. The optimum reaction conditions were obtained from saponification value determination titration, namely at a temperature of 150â°C, a stirring speed of 1200 rpm, and a reaction time of 14 hours. The synthesis product of TETA-PCO A was purified to obtain TETA-PCO B. TETA-PCO B was then identified by TLC, characterized by UV-visible spectrophotometry, FTIR spectroscopy and LC-MS. Identification by TLC showed that TETA-PCO B is as polar as its precursor triethylenetetramine. TETA-PCO B provides maximum absorption at 204 nm for its UV-visible spectrum and has the same chromophore groups as palm cooking oil and triethylenetetramine. The FTIR spectrum of TETA-PCO B showed an overlapping of the

TETA-PCO B compounds. In LC-MS, it was found that TETA-PCO B from synthesis at 150â°C, 1200 rpm, and for 14 hours was not an imidazoline compound, but were still its amide intermediates. Imidazoline compounds were obtained at a synthesis temperature of 160â°C. Corrosion inhibition efficiency testing was carried out by gravimetric and electrochemical methods using TETA-PCO A and B from synthesis at 150â°C, 1200 rpm, and for 14 hours. Concentrations were varied at 0, 5, 20, 50, and 100 ppm. The test was carried out for low carbon steel JIS G3123 grade SGD 400D in a corrosion medium in the form of 1.5% NaCl solution which had been flowed with CO2 gas. The highest efficiencies were obtained at the concentration of 100 ppm and the values were 62.12 and 93.52% for TETA-PCO A and B respectively. SEM-EDX results support the high efficiency of TETA-PCO B. The type of corrosion that occured was pitting corrosion. The adsorption of TETA-PCO B on the steel surface is a strong physisorption and is in accordance with the Langmuir isotherm model.