

Pengaruh variasi poliamina pada sintesis senyawa turunan imidazolin-asam stearat menggunakan metode MAOS (microwave assisted organic synthesis) terhadap aktivitasnya sebagai inhibitor korosi pada baja karbon dalam larutan 1% NaCl = The effect of various polyamines in imidazoline-stearic acid derivatives synthesis using MAOS method against its activity as corrosion inhibitor towards carbon steel

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Abstrak

ABSTRACT

Dewasa ini, kebutuhan inhibitor korosi di Indonesia semakin meningkat seiring dengan banyaknya industri minyak dan gas bumi. Oleh karena itu, diperlukan suatu penelitian mengenai sintesis inhibitor korosi khususnya yang berbasis senyawa organik untuk menangani permasalahan tersebut. Senyawa turunan imidazolin merupakan salah satu senyawa organik yang sering digunakan sebagai inhibitor korosi pada baja karbon. Pada penelitian ini, telah berhasil disintesis senyawa turunan imidazolin yaitu EDA-AS, DETA-AS, TETA-AS, dan AEEA-AS dengan mereaksikan asam stearat (AS) dan variasi poliamina dengan menggunakan metode MAOS (Microwave Assisted Organic Synthesis). Persen yield optimum senyawa EDA-AS diperoleh pada waktu sintesis 5 menit (94,28%), DETA-AS 7 menit (89,81%), TETA-AS 9 menit (89,18%), dan AEEA-AS 3 menit (96,21%). Sintesis senyawa TETA-AS menggunakan metode Dean Stark dan refluks juga dilakukan sebagai pembandingan untuk mengetahui metode yang lebih efektif dan efisien, dimana diperoleh % yield tertinggi yaitu menggunakan metode Dean Stark (97,27%), diikuti oleh metode refluks (96,83%) dan MAOS (89,81%). Seluruh senyawa hasil sintesis telah dikonfirmasi strukturnya menggunakan instrumen UV-Vis, FT-IR, ¹H-NMR, dan LC-MS/MS dimana terlebih dahulu diuji kemurniannya menggunakan kromatografi lapis tipis (KLT) dan alat pengukur titik leleh. Hasil sintesis kemudian diuji aktivitasnya sebagai inhibitor korosi terhadap baja karbon dalam larutan 1% NaCl dengan memvariasikan konsentrasi imidazolin (100, 200, 300, 400, dan 500 ppm) yang kemudian diolah dengan menggunakan metode polarisasi Tafel. Nilai %EI tertinggi diperoleh pada penambahan 500 ppm senyawa EDA-AS, DETA-AS, TETA-AS, dan AEEA-AS berturut-turut sebesar 74,21%; 75,90%; 85,52%; dan 89,70%. Penelitian ini telah membuktikan bahwa dengan memvariasikan poliamina akan sangat mempengaruhi aktivitas inhibisi dimana pada senyawa AEEA-AS memiliki aktivitas inhibisi paling besar karena memiliki keelektronegatifan yang lebih besar dibandingkan senyawa lainnya. Berdasarkan data yang diperoleh pada penelitian ini, dapat disimpulkan bahwa senyawa turunan imidazolin dapat memiliki kemampuan sebagai inhibitor korosi pada baja karbon.

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ABSTRACT

Nowadays, the need of corrosion inhibitors in Indonesia is increasing because many oil and gas industries use equipment and instruments made of metal on their operational activities. Therefore, a study is needed on corrosion inhibitor synthesis, especially those derived from organic compounds to solve these problem. Imidazoline derivatives are one of the organic compounds that are often used as corrosion inhibitors in carbon steel. In this study, four imidazoline derivatives, i.e. (EDA-SA), (DETA-SA), (TETA-SA), dan

(AEEA-SA) had been successfully synthesized by reacting Stearic Acid (SA) and various polyamine with variation of reaction time by using MAOS (Microwave Assisted Organic Synthesis) method. The optimum yield of imidazoline derivative compounds were obtained from EDA-SA at 5` (94,28%), DETA-SA at 7` (89,81%), TETA-SA at 9` (89,18%) and AEEA-SA at 3` (96,21%). The synthesis of TETA-SA compounds using the Dean Stark method and reflux was also carried out as a comparison to find out more effective and efficient methods, which obtained the highest% yield using Dean Stark method (97,27%), followed by the reflux method (96,83%) and MAOS (89,81%). All of the synthesized compounds were identified by using thin layer chromatography (TLC) and examined their melting point. The structure of all synthesized compounds had been confirmed by using UV-Vis, FT-IR, ¹H-NMR, and Liquid Chromatography-Mass Spectrometer (LC-MS). All of synthesized was tested for its activity as a corrosion inhibitor of carbon steel in 1% NaCl solution with variation of the imidazoline concentration (100, 200, 300, 400 and 500) ppm which is then processed using the Tafel polarization method. The highest %EI was obtained at 500 ppm of EDA-SA, DETA-SA, TETA-SA, and AEEA-SA with 74,21%; 75,90%; 85,52%; and 89,70%. This study has proven that varying polyamines will greatly influence inhibitory activity where the AEEA-SA compounds have the greatest inhibitory activity due to this compound having greater electronegativity than other compounds. Based on the data obtained in this study, it can be concluded that imidazoline derivative compounds can have the ability as corrosion inhibitors on carbon steel.