

Pengaruh variasi asam lemak jenuh dalam sintesis senyawa turunan imidazolin menggunakan metode MAOS (microwave assisted organic synthesis) terhadap aktivitasnya sebagai inhibitor korosi pada baja karbon = The effect of various saturated fatty acid in imidazoline derivatives synthesis using MAOS (microwave assisted organic synthesis) method against its activity as corrosion inhibitor towards carbon steel

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Abstrak

Imidazolin adalah senyawa heterosiklik yang mengandung nitrogen. Imidazolin dikenal di dunia industri, terutama di industri perminyakan sebagai inhibitor korosi pada kilang minyak baja dalam perairan laut. Dalam penelitian ini, telah berhasil disintesis empat senyawa turunan imidazolin, yaitu N1- 2- 2-undecil-4,5-dihidro-1H-imidazol-1il etil etana-1,2-diamina TETA-AL, N1- 2- 2-tridesil-4,5-dihidro-1H-imidazol-1il etil etana-1,2-diamina TETA-AM, N1- 2- 2-pentadesil-4,5-dihidro-1H-imidazol-1il etil etana-1,2-diamina TETA-AP, dan N1- 2- 2-heptadesil-4,5-dihidro-1H-imidazol-1il etil etana-1,2-diamina TETA-AS dengan mereaksikan TETA trietilentetramina dan variasi asam lemak jenuh berturut-turut asam laurat AL, miristat AM, palmitat AP, dan stearat AS tanpa pelarut dengan variasi waktu reaksi menggunakan metode MAOS Microwave Assisted Organic Synthesis. Yield optimum senyawa turunan imidazolin TETA-AL diperoleh pada waktu sintesis 7 menit 72,64, TETA-AM 9 menit 81,13, TETA-AP 11 menit 84,62, dan TETA-AS 11 menit 87,49. Metode refluks dan Dean Stark dengan pelarut xylene digunakan sebagai pembanding untuk memperoleh metode yang paling efektif dan efisien dalam sintesis senyawa imidazolin TETA-AP, dimana diperoleh yield tertinggi didapatkan pada metode Dean Stark 13 jam 95,89, diikuti dengan metode refluks 13 jam 88,53, dan MAOS 11 menit 84,62. Seluruh senyawa hasil sintesis sudah dikonfirmasi strukturnya menggunakan instrumen spektrofotometer UV-Vis, spektrometer FTIR, spektroskopi ¹H-NMR, dan spektrometer massa MS dengan terlebih dulu diidentifikasi dengan menggunakan kromatografi lapis tipis KLT dan uji penentuan titik leleh. Uji aktivitas sebagai inhibitor korosi terhadap baja karbon dalam larutan NaCl 1 dilakukan pada seluruh senyawa hasil sintesis dengan variasi konsentrasi imidazolin 100, 200, 300, 400, 500 ppm dengan mengukur arus korosi icorr menggunakan potensiostat eDAQ 450 dan Versasat II. Hasil pengukuran arus menggunakan metode voltametri siklik ini kemudian diolah menggunakan metode Polarisasi Tafel untuk menentukan persen efisiensi inhibisi EI. Diperoleh EI tertinggi pada penambahan konsentrasi 500 ppm senyawa TETA-AL, TETA-AM, TETA-AP, dan TETA-AS berturut-turut adalah 74,44; 72,97; 78,55; dan 87,17. Berdasarkan data tersebut, dapat disimpulkan bahwa keempat senyawa imidazolin TETA-AL, TETA-AM, TETA-AP, dan TETA-AS berpotensi sebagai inhibitor korosi pada baja karbon.

.....Imidazoline is a heterocyclic compound containing nitrogen atom. Imidazoline is well known in industry, especially in petroleum field as a corrosion inhibitor of oil refineries in sea environment. In this study, four imidazoline derivatives, i.e. N1 2 2 undecyl 4,5 dihydro 1H imidazol 1yl ethyl ethane 1,2 diamine TETA LA, N1 2 2 tridecyl 4,5 dihydro 1H imidazol 1yl ethyl ethane 1,2 diamine TETA MA, N1 2 2 pentadecyl 4,5 dihydro 1H imidazol 1yl ethyl ethane 1,2 diamine TETA PA, and N1 2 2 heptadecyl 4,5

dihydro 1H imidazol 1yl ethyl ethane 1,2 diamine TETA SA had been successfully synthesized by reacting TETA triethylenetetramine and various saturated fatty acid, such as lauric LA , miristic MA , palmitic PA , and stearic acid SA , respectively, with solvent free and variation of reaction time by using MAOS Microwave Assisted Organic Synthesis method. The optimum yield of imidazoline derivative compounds were obtained from TETA AL at 7 rsquo 72,64 , TETA AM at 9 rsquo 81,13 , TETA AP at 11 rsquo 84,62 , and TETA AS at 11 rsquo 87,49 . Reflux and Dean Stark methods in xylene were also conducted as a comparison to obtained the most effective and efficient methods in imidazoline TETA AP synthesis, which the highest yield was obtained from Dean Stark method at 13 h 95,89 , followed by reflux method at 13 h 88,53 , and MAOS method at 11 rsquo 84,62 . 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 spectrophotometer, FT IR spectrometer, 1H NMR spectroscopy, and mass spectrometer MS . Inhibition corrosion test of carbon steel in 1 NaCl solution was performed on all synthesized imidazoline derivatives compounds with variation of imidazoline concentration 100, 200, 300, 400, 500 ppm by measuring the corrosion current i_{corr} using potentiostat eDAQ 450 and Versasat II . Using cyclic voltammetry method, the measurement result were processed through Tafel Polarization to obtain the percentage of inhibition efficiency EI . The highest EI was obtained at 500 ppm of TETA AL, TETA AM, TETA AP, and TETA AS with 74,44 , 72,97 , 78,55 , and 87,17 , respectively. It can be concluded that all of the imidazoline compounds i.e. TETA AL, TETA AM, TETA AP, and TETA AS are potential organic compound as a corrosion inhibitor towards carbon steel.