

ABSTRACT

STRUCTURE ELUCIDATION OF 4-VINYLPYRIDINE DIMER AND ACTIVITY TESTS AS CORROSION INHIBITOR FOR MILD STEEL IN CO₂-SATURATED BRINE SOLUTION

By

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The dimerization of 4-vinylpyridine monomer has been carried out through oxidative coupling method using methanol as a solvent and hydrochloric acid (HCl) as a catalyst. The dimerization product was compared with its monomer using thin layer chromatography (TLC) and fourier transform infrared (FTIR) spectroscopy. Molecular weight screening and compound structure elucidation were carried out using liquid chromatography-mass spectrometry (LC-MS) for identification of 4-vinylpyridine dimer, D(4-VP). D(4-VP) was evaluated as a corrosion inhibitor for mild steel in a brine solution saturated with CO₂ using wheel test method. Mild steel surface morphology analysis was performed using scanning electron microscope (SEM). The D(4-VP) was appeared as a transparent yellow diluted liquid. TLC and FTIR results showed a slight difference between monomer and D(4-VP) by the spots and functional groups, respectively. LC-MS screening result showed that the formation of D(4-VP) identified at retention time of 6.18, 6.59, and 16.22 minutes. The wheel test of D(4-VP) showed a corrosion inhibition activity, where an inhibition efficiency (IE) increased with an increase of D(4-VP) concentration. The highest IE (63.12%) was reached out at the highest concentration used (200 mgL⁻¹). Mild steel protection was also supported by a surface visualization using SEM.

Keywords: mild steel, CO₂ corrosion, corrosion inhibitor, 4-vinylpyridine dimer, oxidative coupling.

ABSTRAK

ELUSIDASI STRUKTUR DIMER 4-VINILPIRIDIN DAN UJI AKTIVITAS SEBAGAI INHIBITOR KOROSI BAJA LUNAK DALAM *BRINE SOLUTION* YANG JENUH CO₂

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Dimerisasi 4-vinilpiridin telah dilakukan dengan menerapkan metode kopling oksidatif menggunakan pelarut metanol dan katalis asam klorida (HCl). Produk hasil dimerisasi dibandingkan dengan monomernya menggunakan kromatografi lapis tipis (KLT) dan spektroskopi *fourier transform infrared* (FTIR). *Screening* berat molekul dan elusidasi struktur senyawa dilakukan menggunakan kromatografi cair-spektrometri massa (LC-MS) untuk identifikasi dimer 4-vinilpiridin, D(4-VP). Senyawa D(4-VP) diuji aktivitasnya sebagai inhibitor korosi terhadap baja lunak dalam *brine solution* yang jenuh CO₂ menggunakan metode *wheel test*. Analisis morfologi permukaan baja lunak dilakukan menggunakan *scanning electron microscope* (SEM). Senyawa D(4-VP) berwujud *liquid* berwarna kuning transparan. Hasil KLT dan FTIR masing-masing menunjukkan adanya sedikit perbedaan antara monomer dan produk dimerisasi berdasarkan identifikasi noda dan gugus fungsi. Hasil *screening* LC-MS menunjukkan bahwa pembentukan senyawa D(4-VP) teridentifikasi pada waktu retensi 6.18, 6.59, and 16.22 menit. Hasil pengujian metode *wheel test* menunjukkan aktivitas inhibisi dari senyawa D(4-VP) terhadap korosi, di mana efisiensi inhibisi (IE) meningkat dengan meningkatnya konsentrasi D(4-VP) yang digunakan. Nilai IE terbesar (63.12%) telah dicapai pada konsentrasi D(4-VP) tertinggi yang digunakan (200 mgL⁻¹). Proteksi baja lunak juga didukung dengan visualisasi permukaan menggunakan SEM.

Kata kunci: baja lunak, korosi CO₂, inhibitor korosi, dimer 4-vinilpiridin, kopling oksidatif.