

ABSTRAK

KONVERSI MINYAK KELAPA SAWIT MENJADI SENYAWA NITROGEN MENGGUNAKAN ZEOLIT-Y TERPROTONASI SEBAGAI KATALIS DAN UJI AKTIVITAS INHIBITOR KOROSI

Oleh

MELISSAPUTRI

Korosi pada baja lunak merupakan masalah di industri, khususnya industri minyak bumi dan gas karena dapat menyebabkan kerusakan material dan kerugian ekonomi, sehingga perlu diatasi menggunakan inhibitor korosi yang ramah lingkungan dan efisien. Penelitian ini bertujuan untuk mensintesis inhibitor korosi berbasis minyak kelapa sawit melalui reaksi dua tahap yaitu transesterifikasi dan amidasi menggunakan katalis zeolit-Y dan zeolit-Y terprotonasi (H-Y) serta uji aktivitas sebagai inhibitor korosi pada baja lunak dalam medium korosif jenuh CO₂.

Zeolit-Y disintesis dari silika sekam padi melalui metode hidrotermal dan dikarakterisasi menggunakan *X-Ray Diffraction* (XRD) dan *Scanning Electron Microscopy* (SEM). Hasil XRD menunjukkan bahwa zeolit-Y yang terbentuk sesuai dengan standar IZA dan hasil SEM menunjukkan bentuk kristal kubik oktahedral. Zeolit-Y diprotonasi menggunakan larutan NH₄NO₃ 3,5 M melalui metode *ion exchange* untuk menghasilkan zeolit H-Y dan dikarakterisasi menggunakan *X-Ray Fluorescence* (XRF) menghasilkan konversi Na menjadi H sebesar 65,50%. Reaksi transesterifikasi minyak kelapa sawit dan metanol menggunakan kedua katalis menghasilkan metil ester dengan konversi tertinggi sebesar 32% (H-Y). Metil ester yang diperoleh direaksikan dengan dietanolamina menggunakan katalis yang sama dan selanjutnya dianalisis menggunakan *Gas Chromatography-Mass Spectrometry* (GC-MS) menghasilkan senyawa nitrogen sebesar 99,10% (H-Y).

Senyawa nitrogen yang diperoleh diuji aktivitasnya sebagai inhibitor korosi baja lunak dalam larutan NaCl 3% yang jenuh CO₂ menggunakan metode *wheel test* menunjukkan persen proteksi sebesar 98,17%. Hasil ini didukung oleh data SEM yang menunjukkan morfologi permukaan baja lunak dengan adanya inhibitor korosi terlindungi dengan baik dibandingkan dengan tanpa inhibitor korosi.

Kata kunci: inhibitor korosi, senyawa nitrogen, minyak kelapa sawit, zeolit-Y terprotonasi.

ABSTRACT

CONVERSION OF PALM OIL TO NITROGEN COMPOUND USING PROTONATED ZEOLITE-Y AS A CATALYST AND CORROSION INHIBITOR ACTIVITY

By

MELISSAPUTRI

Corrosion of mild steel is a problem in industry, especially the oil and gas industry because it can cause material damage and economic losses, so it needs to be overcome using environmentally friendly and efficient corrosion inhibitors. This study aims to synthesize palm oil-based corrosion inhibitors through two stage reactions, namely transesterification and amidation using two catalysts namely zeolite-Y and protonated zeolite-Y (H-Y) as well as test activity as corrosion inhibitor on mild steel in a CO₂ saturated corrosive medium. Zeolite-Y was synthesized from rice husk silica through hydrothermal method and characterized using X-Ray Diffraction (XRD) and Scanning Electron Microscopy (SEM). The XRD result showed that the formed zeolite-Y complies with the IZA standard and the SEM result showed an cubic octahedral crystal form. Zeolite-Y was protonated using 3.5 M NH₄NO₃ solution by ion exchange method to produce zeolite H-Y and characterized using X-Ray Fluorescence (XRF) resulting in a conversion of Na to H of 65.50%. The transesterification reaction of palm oil and methanol using both catalysts produced methyl ester with the highest conversion of 32% by using zeolite H-Y. The obtained methyl ester was reacted with diethanolamine using the same catalyst and then analyzed using Gas Chromatography-Mass Spectrometry (GC-MS) to produce a nitrogen compound of 99.10% (H-Y). The obtained nitrogen compounds were tested for their activities of mild steel corrosion inhibitors in a 3% NaCl solution saturated with CO₂ using the wheel test method, showing the best percentage of protection was 98.17%. This result was supported by SEM data which showed that the surface morphology of mild steel with the presence of corrosion inhibitor was well protected compared to without corrosion inhibitor.

Keywords: corrosion inhibitor, nitrogen compounds, palm oil, protonated zeolite-Y.