

**PREPARATION AND CHARACTERIZATION OF Ni/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, Mo/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, NiMo/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> CATALYSTS AND THEIR APPLICATION IN HYDROCRACKING OF NYAMPLUNG (*Calophyllum inophyllum* L.) SEED OILS INTO BIOFUEL**

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**ABSTRACT**

Preparation and characterization of Ni/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, Mo/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, NiMo/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> catalysts and their applications in hydrocracking of nyamplung (*Calophyllum inophyllum* L.) seed oils into biofuel has been conducted. The purposes of this research were to studies the characters of Ni/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, Mo/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, NiMo/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> catalysts and their catalytic activities in the hydrocracking of nyamplung oil. The variation of Ni and Mo metals in the monometal catalysts were 15%, in the bimetal catalysts were 7,5:7,5 and 15:15. The catalysts were characterized using X-Ray Diffraction (XRD), Atomic Absorption Spectrophotometer (AAS), Branauer-Emmett-Teller (BET) and Scanning Electrone Microscope (SEM). The catalytic activity test was conducted in the hydrocracking of nyamplung oil. The hydrocracking of nyamplung oil was conducted in fixed bed reactor (semi-flow) system with temperature 550 °C, H<sub>2</sub> gas flow 30 mL min<sup>-1</sup> and ratio of catalyst:feed (1:100).

The result of XRD analysis showed the  $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, Ni15/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, Mo15/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, Ni7,5Mo7,5/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> and Ni15Mo15/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> catalysts were amorphous. The metals which support in the catalyst resulting some new peaks, the peak of NiO and MoO<sub>2</sub>, the surface area of catalyst decreased, the acidity of catalyst increased and did not damage the structure of  $\gamma$ -Al<sub>2</sub>O<sub>3</sub>. The surface area of catalysts were 127,182, 97,9835, 113,279 and 104,314 m<sup>2</sup>/g sequencely. The Ni15Mo15/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> catalyst showed the best activity conversion about 97.79% wt.% with the best selectivity by resulting gasoline (C<sub>5</sub>-C<sub>12</sub>) fraction dominant.

Key words : gasoline (C<sub>5</sub>-C<sub>12</sub>), hydrocracking, catalyst, nyamplung oil.

**PREPARASI DAN KARAKTERISASI KATALIS Ni/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, Mo/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, NiMo/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> DAN APLIKASINYA DALAM HIDRORENGKAH MINYAK BIJI NYAMPLUNG (*Calophyllum inophyllum L.*) MENJADI BIOFUEL**

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**INTISARI**

Preparasi dan karakterisasi katalis Ni/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, Mo/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, NiMo/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> dan aplikasinya dalam hidrorengkah minyak biji nyamplung (*Calophyllum inophyllum L.*) menjadi *biofuel* telah dilakukan. Tujuan penelitian ini adalah mempelajari karakter katalis Ni/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, Mo/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, NiMo/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> dan aktivitas katalitiknya pada proses hidrorengkah minyak nyamplung. Variasi logam Ni dan Mo pada katalis monometal yaitu 15% serta pada katalis bimetal Ni:Mo sebesar 7,5:7,5 dan 15:15. Katalis dikarakterisasi menggunakan *X-Ray Diffraction* (XRD), *Atomic Absorption Spectrophotometer* (AAS), *Branauer-Emmett-Teller* (BET) dan *Scanning Electrone Microscope* (SEM). Uji aktivitas katalis dilakukan melalui proses hidrorengkah minyak nyamplung. Hidrorengkah minyak nyamplung dilakukan dalam reaktor *fixed bed* (*semi-flow*) pada suhu 550 °C, laju alir gas H<sub>2</sub> (30 mL/menit) dan rasio katalis:umpan (1:100).

Hasil analisis XRD menunjukkan katalis  $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, Ni<sub>15</sub>/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, Mo<sub>15</sub>/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub>, Ni<sub>7,5</sub>Mo<sub>7,5</sub>/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> dan Ni<sub>15</sub>Mo<sub>15</sub>/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> merupakan katalis *amorphous*. Logam yang teremban pada katalis mengakibatkan munculnya puncak baru NiO dan MoO<sub>2</sub>, luas permukaan katalis menurun, nilai keasaman meningkat dan tidak terjadi kerusakan struktur  $\gamma$ -Al<sub>2</sub>O<sub>3</sub>. Luas permukaan katalis berturut-turut, yaitu 127,182, 97,9835, 113,279 dan 104,314 m<sup>2</sup>/g. Katalis Ni<sub>15</sub>Mo<sub>15</sub>/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> menunjukkan aktivitas konversi tertinggi sebesar 97,79 % b/b dengan selektivitas terbaik dalam menghasilkan fraksi produk cair dominan *gasoline* (C<sub>5</sub>-C<sub>12</sub>).

Kata kunci : *gasoline* (C<sub>5</sub>-C<sub>12</sub>), hidrorengkah, katalis, minyak nyamplung