

SINTESIS DAN UJI KINERJA ASAM BUTIL LIGNOSULFONAT DAN SELULOSA SULFAT DARI TANDAN KOSONG KELAPA SAWIT SEBAGAI SURFAKTAN UNTUK BAHAN *ENHANCED OIL RECOVERY* (EOR)

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INTISARI

Sintesis senyawa asam butil lignosulfonat dan selulosa sulfat dari tandan kosong kelapa sawit yang bertujuan untuk pengembangan surfaktan dari bahan alam telah dilakukan.

Isolasi lignin dan selulosa dilakukan melalui metode sulfat (Kraft) menggunakan NaOH, Na₂S dan Na₂CO₃. Lignin hasil isolasi dialkilasi menggunakan butil klorida menghasilkan butil lignin. Butil lignin selanjutnya disulfonasi menggunakan NaHSO₃ 25% menghasilkan asam butil lignosulfonat. Sementara itu, selulosa disulfonasi dengan NaHSO₃ 15% dan diperoleh produk selulosa sulfat. Senyawa yang telah tersintesis dikarakterisasi menggunakan spektrofotometer FTIR dan SEM-EDX. Asam butil lignosulfonat dan selulosa sulfat diuji kinerjanya sebagai bahan EOR melalui *screening test*, berupa uji kompatibilitas, penentuan nilai konsentrasi kritis misel (KKM), uji kelakuan fasa serta penentuan nilai tegangan antarmuka (*Interfacial Tension/IFT*).

Isolasi lignin dan selulosa menghasilkan rendemen 27,8 dan 48,8% secara berturut-turut. Pada alkilasi dan sulfonasi lignin diperoleh rendemen sebesar 88 dan 65%. Sulfonasi pada selulosa menghasilkan rendemen 75,60%. Keberhasilan reaksi sulfonasi selulosa dan butil lignin dikonfirmasi dari kenaikan persen atom oksigen dan sulfur menggunakan SEM-EDX. Asam butil lignosulfonat dan selulosa sulfat memiliki nilai KKM pada konsentrasi 1,3 dan 1,5 g/L secara berturut-turut. Uji kompatibilitas menunjukkan bahwa asam butil lignosulfonat dan selulosa sulfat cukup kompatibel dalam NaCl jenuh (15000 ppm) pada konsentrasi 1,5 g/L. Sementara itu, uji kelakuan fasa surfaktan menunjukkan terjadi pembentukan mikroemulsi fasa tengah antara campuran surfaktan:air:solar pada konsentrasi 1,5 g/L. Hasil IFT pada asam butil lignosulfonat dan selulosa sulfat 1,5 g/L diperoleh nilai 9,26 dan 11,41 *dyne/cm*.

Kata Kunci : asam butil lignosulfonat, selulosa sulfat, surfaktan

SYNTHESIS AND PERFORMANCE TEST OF BUTYL LIGNOSULFONIC ACID AND CELLULOSE SULPHATE FROM EMPTY FRUIT BUNCHES OF PALM OIL AS SURFACTANT FOR ENHANCED OIL RECOVERY (EOR)

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ABSTRACT

Synthesis of butyl lignosulfonic acid and cellulose sulphate from empty fruit bunches of palm oil aimed to develop surfactants from natural resources has been done.

Isolation of lignin and cellulose was done by sulphate method (Kraft) using NaOH, Na₂S and Na₂CO₃. The isolated lignin was then alkylated using butyl chloride to produce butyl lignin. Butyl lignin was further sulfonated using 25% of NaHSO₃ to give butyl lignosulfonic acid. Meanwhile, cellulose was sulfonated using 15% of NaHSO₃ to afford cellulose sulphate. The synthesized compounds were characterized using FTIR and SEM-EDX spectrophotometers. The synthesized butyl lignosulfonic acid and cellulose sulphate were tested for their performance as enhanced oil recovery material through screening test in the form of compatibility test, determination of critical micelle concentration (CMC) value, phase behavior test and interfacial tension (IFT) value determination.

Isolation of lignin and cellulose produced yield 27.8 and 48.8% respectively. Alkylation and sulfonation of lignin afforded rendement of 88 and 65%. Sulfonation in cellulose give 75.60% yield. The success of sulphonation of cellulose and butyl lignin reactions was indicated by the increase in the percentage of oxygen and sulphur atoms using SEM-EDX. Butyl lignosulfonic acid and cellulose sulphate have CMC values at concentrations of 1.3 and 1.5 g/L respectively. The compatibility test showed that butyl lignosulfonic acid and cellulose sulfate were compatible enough in formation water (15000 ppm) at concentration of 1.5 g/L. Meanwhile, the surfactant phase behavior test showed that there was a microemulsion formed between the surfactant mixture: water: diesel at a concentration of 1.5 g/L. IFT results in butyl lignosulfonic acid and cellulose sulphate 1.5 g/L were obtained at 9.26 and 11.41 dyne/cm.

Keywords : butyl lignosulfonic acid, cellulose sulphate, surfactant