SYNTHESIS OF OCTYL LIGNOSULFONIC ACID AND CELLULOSE SULFATE AS SURFACTANT FROM SAWDUST FOR ENHANCED OIL RECOVERY

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ABSTRACT

Synthesis of octyl lignosulfonic acid and cellulose sulfate as a surfactant for Enhanced Oil Recovery (EOR) has been carried out. Sodium sulfite (Na_2SO_3) was used as a reagent for sulfonation of lignin to obtain octyl lignosulfonic acid. Sulfonation of cellulose was performed by direct method with H_2SO_4 and C_2H_5OH in mild condition. Characterization of the compound was done by using FTIR spectrophotometer and SEM-EDX. Octyl lignosulfonic acid and cellulose sulfate which have been synthesized, were tested of several tests for surfactant performance include compatibility, phase behavior, and interfacial tension (IFT).

The results showed that the lignin absorption bands were confirmed around 1326-1330 cm^{-1} and 1219-1265 cm^{-1} which were caused by stretching vibrations of syringyl and guaiacyl rings. Sulfonation of lignin was confirmed at 1172 and 1126 cm^{-1} assigned to the stretching vibration of S=O bond. For cellulose, the specific absorption band was confirmed at 894 cm^{-1} assigned to vibration of β-1,4-glycosidic. For cellulose sulfate, new absorption bands located at 1180 cm^{-1} and 1126 cm^{-1} assigned to the stretching vibration of S=O bond. After sulfonation process, EDX data showed that the percentage of oxygen and sulfur atoms increased for octyl lignosulfonic acid and cellulose sulfate. Both of octyl lignosulfonic acid and cellulose sulfate were compatible in oil field water with middle phase behavior and the interfacial tension of octyl lignosulfonic acid and cellulose sulfate were 2.85 x 10^{-1} mN/m and 3.03 x 10^{-1} mN/m, respectively.

Keywords: cellulose sulfate, octyl lignosulfonic acid, surfactant