Effect of UH-biosurfactant on the Chemical Composition of A Vegetable Oil based Ester Drilling Fluid

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Abstract
The effect of UH-biosurfactant on the composition of the vegetable oil based ester drilling fluid (VEDF) was investigated. Samples of VEDF with and without UH-biosurfactant were subjected to UV spectral analysis. The experiments were performed at a constant room temperature. Results showed that the presence of UH-biosurfactant brought changes in methyl linoleate and methyl stearate esters.

1. Introduction

The revolution in OBMs began in the early 1990s with the advent of synthetic-based drilling fluids. The primary reason was biodegradability of the residual oil on drilled cuttings. Esters were the first synthetic base used to formulate the drilling fluids. A base fluid that would anaerobically biodegrade might solve this problem. The search for such fluids led to esters, in the belief that their "built-in oxygen" would enable these materials to biodegrade without the assistance of dissolved oxygen. Every invert emulsion has to be stabilized using a surfactant. Effect of surfactant has always been studied on the basis of its surface tension. This study deals with the chemical changes occurring in the vegetable oil based ester (Zawadzki, Shrestha, & He, 2007). The ultraviolet (UV) absorption spectroscopy is considered to be a reliable and affordable technology for characterizing vegetable oil based ester based on the absorbance patterns of the aromatic compounds in the proposed spectrum.

2. Objective

The objective of this study was to determine the effect of UH-biosurfactant on the composition of a vegetable oil based ester drilling fluid at room temperature.

3. Materials and Methods

Soybean oil based Fatty Acid Methyl Ester was synthesized in the laboratory using trans-esterification process at room temperature. The control sample of the vegetable oil based ester had no surfactant. The second sample was prepared by adding 1 % UH-biosurfactant, measured as a % by weight of ester content. Both samples were prepared and tested at room temperature. The UV spectrum of all the samples were obtained using UV spectrophotometer.

4. Results and Discussions

As shown in figure 1, the individual peaks of the constituent esters were identified and highlighted in the UV spectrum of the vegetable oil based ester. The first would be methyl oleate which picks up the UV peak at 220 nm. The next one to show up on the plot is methyl linoleate at 270 nm followed by methyl stearate at 290 nm. The last constituent recorded by the spectrophotometer was methyl palmitate whose peak was seen at 324 nm (Qingsu, et al., 2006). Figure 2 shows the UV print of biosurfactant in the vegetable oil based ester base fluid. The plot clearly shows that methyl linoleate and methyl stearate undergo chemical modifications while the rest of the esters in FAME remain unaltered. These modifications help in understanding the possible causes for the changes occurring in the stability of the base fluid due to the presence of UH-biosurfactant.

5. Conclusion

It was found that presence of UH-biosurfactant considerably affected the composition of the vegetable oil based ester base fluid. Even though the effect was not uniform with all its constituents, a concentration of 1 % UH-biosurfactant changed the methyl linoleate and methyl stearate ester constituents chemically which is clearly pronounced by the UV prints.

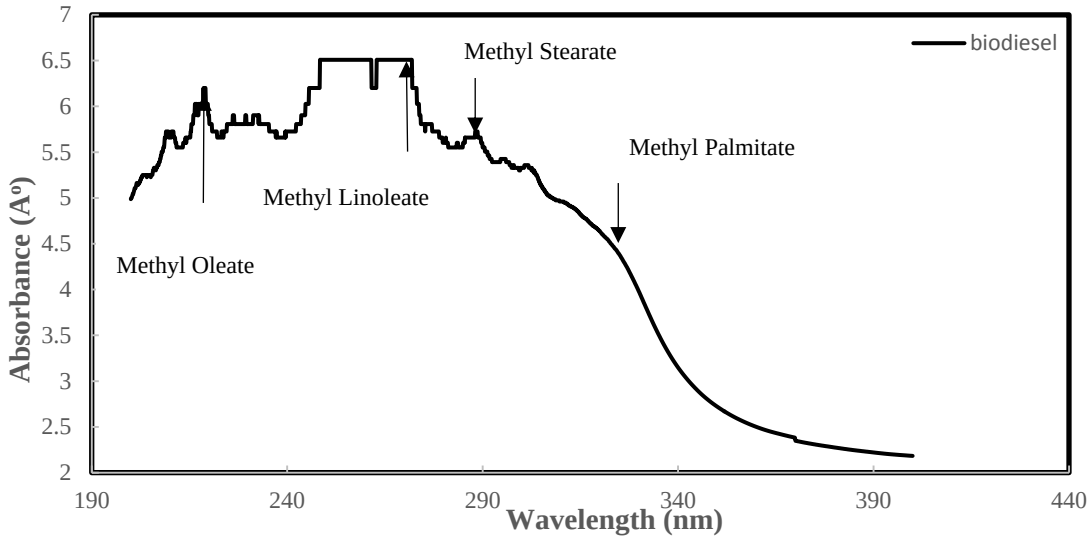

Figure 1 UV spectrum of Vegetable oil based Ester

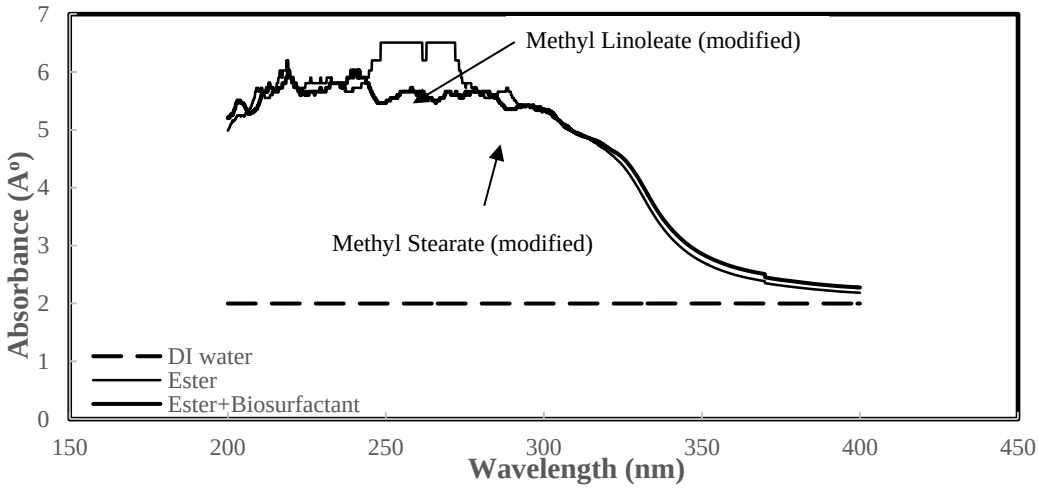

Figure 2 UV analysis of effect of UH-Biosurfactant

6. Conclusion

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7. Acknowledgement

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8. References

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