

Oil Spill Remediation by Using UH-Biosurfactant

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Abstract

The ability of UH-biosurfactant for oil cleaning was tested by dispersion method and emulsification method. Results showed that 2 times more of diameter of octane can be formed with addition of 200 mg/L of biosurfactant. And the emulsification of form oil was in proportion to the concentration of the biosurfactant in the tested scale. UH-biosurfactant can be used in cleaning of oil spill contamination.

1. Introduction

Oil spill accidents bring significant contamination to ocean and shoreline environment. Biosurfactants have been used in oil mobilization for petroleum hydrocarbon (aliphatic and aromatic) contamination and halogenated compounds contamination. Biosurfactant can enhance the dispersion of oil and its removal from the contaminated surface (Saeki *et al.* 2009), it can also increase the biodegradability of the oil by emulsification (Reilly *et al.* 1997), also biosurfactant is biodegradable (Makkar and Rockne 2003). Emulsification is the result brought by biosurfactant with reduced surface tension between hydrophobic and hydrophilic phases of oil in water, and it will produce small droplets of oil, which increases the surface area exposed to naturally occurring microorganisms, so the increase of uptake and utilization by microorganisms.

2. Objective

To test UH-biosurfactant's ability in cleaning oil whose density is lighter than water by dispersion test and emulsification test.

3. Materials and Methods

Octane, one of the main component in gasoline was used to testify the dispersion ability of UH-biosurfactant. A 20 cm×20 cm square plate was used: 125 mL D.I. water was firstly added, then 5 μ L of octane was added in the center, lastly, 1 μ L of biosurfactant with concentrations of 20~200 mg/L was added on the center of octane, measure the diameter of octane afterwards, 1 μ L of D.I. water addition was made as control. The biosurfactant was got after seven days fermentation with *Serratia* sp. as source bacteria, and used vegetable oil as substrate, and purification afterwards. The emulsification activity of the biosurfactant was measured by form oil which is a mixture of pure paraffinic base oil and petroleum distillate. 50 μ L of form oil and 1 mL of biosurfactant with concentration of 20~40 mg/L were added to 9 mL of 0.05 M phosphate buffer (ph=7) in a test tube. Vortex the tube for 2 min, then test the optical density at 375 nm using UV-vis spectrophotometer. The emulsion turbidities of the biosurfactant sample was tested every six minutes over 30 min period and was compared.

4. Results and Discussion

The result of dispersion test showed that UH-biosurfactant can help disperse octane on water surface (Figure 1), with approximately 3 times the diameter with 200 mg/L of biosurfactant compared with the control at 10 s. And for addition of biosurfactant fermentation liquid after 7 days cultivation directly, an octane circle with diameter larger than 10 cm was instantly formed, which means that the biosurfactant has good ability to

remove oil from the contaminated surface. This test can also be used as fast judgment of the existence of dispersants.

The emulsification test showed the emulsification of the oil was more with biosurfactant concentration of 40 mg/L compared to 20 mg/L, as higher is the reading of optical density (OD) with UV-vis spectrophotometer at the specific absorption length of 375 nm for form oil (Figure 2). And with time from 0~30 min, the emulsification of the oil reduced (Figure 2), as more proportions of the oil was floating up to the surface.

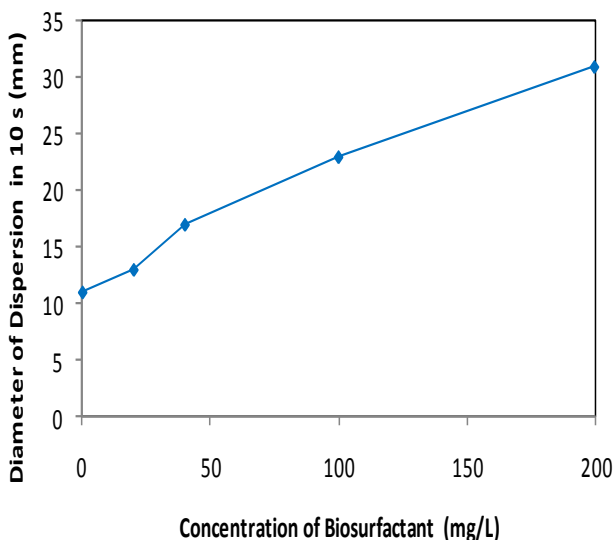


Figure 1 Diameter of Oil Dispersion with Different Concentrations of Biosurfactant

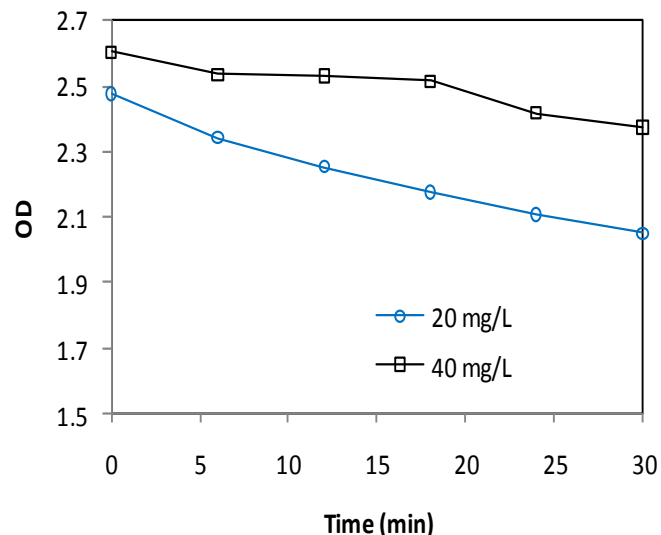


Figure 2 OD Reading for Oil with time and Different concentrations of Biosurfactant

5. Conclusions

UH-biosurfactant has good ability to disperse and emulsify oil. It can be used in cleaning of oil spill contamination.

6. Acknowledgments

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7. References

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