Removal of Lead from Wastewater Using a Biosurfactant

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Abstract

Lead removal form wastewater was studied using the UH-biosurfactant. Lead concentration varied from 10 to 100 mg/L and pH varied from 2.5 to 12. Commercially available surfactants such as SDS and Triton X-100 were also used for comparison. Results have shown that biosurfactant removed over 75% of lead from water and the optimum lead-biosurfactant ratio was 0.01.

1. Introduction

There is an increased interest in using surfactants to complex metals from waste streams from industrial discharge and mining operations. Biosurfactants are surface active agents derived from biological sources which, like synthetic surfactants, exhibit characteristic physical and chemical properties. Previous work has demonstrated efficient metal complexion in solution by a biosurfactant, rhamnolipid, that was produced by *Pseudomonas aeruginosa* [3]. UH-biosurfactant is of particular interest for use in metal removal for several reasons: (1) produced from used vegetable oil and is biodegradable, (2) surface tension of 29 dyne/cm at a CMC of 0.7 g/L, and (3) can be produced in-situ.

2. Objective

The objective of this study is to determine the UH-biosurfactant selectivity for lead at various pH of the wastewater.

3. Testing Program

Certified standard reference solution (1000 ppm 1%) was used in this study. Lead solutions were mixed with biosurfactants in a beaker and stirred with pH adjustment using 1 N of NaOH. About 50 mL of solution was then taken and filtered through 0.2-mm syringe filter. Atomic absorption spectroscopy (AA) was used to measure the concentration of metals in the filtered samples.

4. Results and discussion

Experiments were performed in batch reactors. pH was raised to 12 because the study showed that biosurfactant was efficient when the pH was higher than 12. After mixing lead solution with surfactants, 0.2-mm filters were used to separate the micelle from the mixing solution and the lead concentration in the liquid phase was measured using the AA. Lead removal from water using biosurfactant was performed with 10 and 100 mg/L lead solution ($Pb(NO_3)_2$). For comparison purposes, commercially available synthetic surfactants were used. Results showed that biosurfactant achieved more than 75% of lead removal efficiency when 10 CMC was used (Figure 1). Figure 2 showed an optimum ratio for lead to biosurfactants. According to the preliminary test results, maximum efficiency was obtained at the lead/biosurfactants ratio of 0.01.

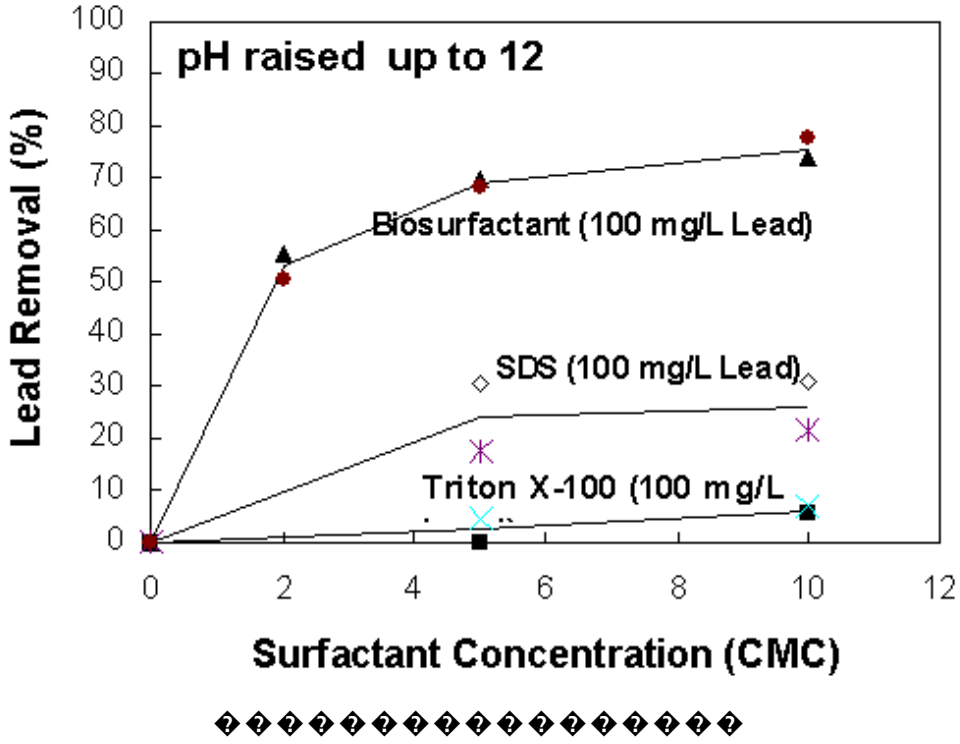

Figure 1. Lead Removal Efficiency with Surfactants (100 mg/L Pb)

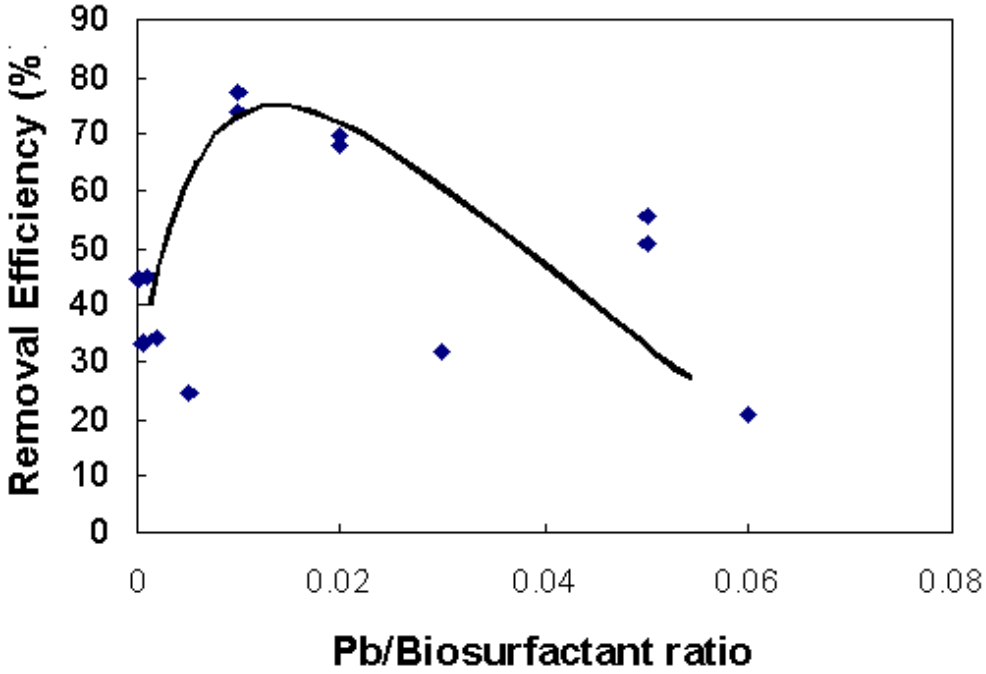

Figure 2. Lead Removal Efficiency with different Pb/Biosurfactant Ratio

5. Conclusion

����� From the preliminary test results on lead removal, the following conclusions can be drawn.

1. Biosurfactant removed over 75% of lead from wastewater. It was more effective than SDS and Triton X-100.
2. The optimum lead-biosurfactant ratio was 0.01.

6. Acknowledgment

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7. References

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If you have any questions, please contact **Dr. C.Vipulanandan**