North-East Research Conclave

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Track: (SE)

Screening of chemicals (alkali and salts) for biosurfactant based *ex-situ* Microbial Enhanced Oil Recovery

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Abstract

Enhanced oil recovery (EOR) technologies are utilized to recover two-thirds of oil remaining in reservoirs after applying conventional primary and secondary recovery processes [1]. Microbial enhanced oil recovery (MEOR) is a promising enhanced oil recovery (EOR) technology that has gained widespread acceptance due to its cost-effectiveness and environmental benefits [2]. Microorganisms and their metabolites are utilised for *in-situ* and *ex-situ* MEOR, respectively, to recover the residual oil from oil reservoirs. Biosurfactants are microbial metabolites that reduce the interfacial tension and surface tension besides contributing to surface wettability modification [3].

The present study aims to use biosurfactants with different chemical salts like Sodium Sulphate (Na_2SO_4), Sodium Chloride (NaCl), Sodium Bicarbonate ($NaHCO_3$), Sodium Hydroxide (NaOH), Sodium Nitrate ($NaNO_3$), Magnesium Chloride ($MgCl_2$), Copper Chloride ($CuCl_2$), Calcium Carbonate ($CaCO_3$) and Zinc Chloride ($ZnCl_2$) and investigate the interfacial properties to demonstrate varied options to recover oil.

The addition of salts was found to decrease the surface tension as well as to reduce the critical micelle concentration (CMC) of the biosurfactant as shown in Figure 1. The insights of these observations were investigated.

Keywords: Microbial enhanced oil recovery, Critical micelles concentration, *Bacillus subtilis* MG495086, *Pseudomonas aeruginosa*.

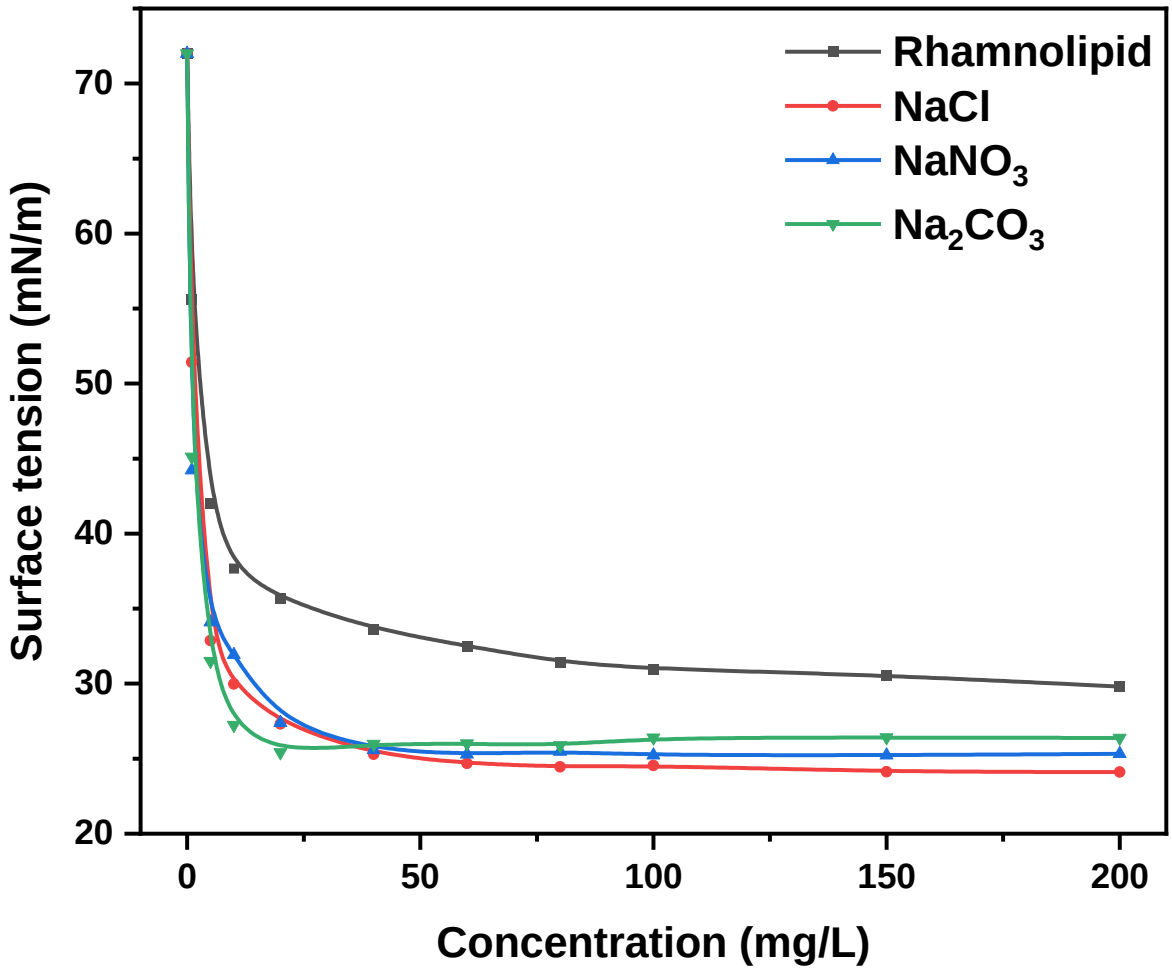

Figure 1: **The surface tension of different salts with varying concentrations.**

References

[1] Cui, K., Zhang, Z., Zhang, Z., Sun, S., Li, H., & Fu, P. (2019). Stimulation of indigenous microbes by optimizing the water cut in low permeability reservoirs for green and enhanced oil recovery. *Scientific reports*, *9*(1), 1-12.

[2] Datta, P., Tiwari, P., & Pandey, L. M. (2020). Oil washing proficiency of biosurfactant produced by isolated Bacillus tequilensis MK 729017 from Assam reservoir soil. *Journal of Petroleum Science and Engineering*, *195*, 107612.

[3] Gunther IV, Nereus W., et al. "Production of rhamnolipids by Pseudomonas chlororaphis, a nonpathogenic bacterium." *Applied and environmental microbiology* 71.5 (2005): 2288-2293.