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## Sustainable flotation solutions: Investigating the impact of biological origin surfactants on bubble-particle interactions

Froth flotation is a selective separation process based on the differences in surface properties of the mineral particles. The desired modification of surface properties is achieved through the addition of surface-active substances. The vast majority of currently employed chemicals are of synthetic origin. Therefore, efforts are being made to replace them with natural, biodegradable equivalents, such as those produced by microorganisms. Biosurfactants are more beneficial than synthetic surfactants in terms of high biodegradability, lower toxicity, environmental compatibility and production from renewable sources –advantages that synthetic surfactants do not exhibit.

Our research aimed to determine how Rhamnolipid biosurfactant (RL) produced by Pseudomonas aeruginosa affects the fundamental act of the flotation, i.e. bubble-particle attachment. The process of air bubble adhesion to the surface of a solid with varying degrees of hydrophobicity was evaluated at different concentrations of RL, up to 500 mg·dm–3, both at pH 5 (RL non-ionic form) and pH 10 (RL anionic form).

The dependence of the three-phase contact (TPC) formation time on biosurfactant concentration was determined by monitoring the bubble-solid surface interactions using a high-speed camera. It was found that as the concentration of RL rises, the time needed for TPC formation extends as a result of an increase in the film drainage time. A significant effect of RL on the TPC line expansion (lower rate) and the size of the contact area between the bubble and the surface (smaller surface area) was also noted. At excessively high concentrations, the use of rhamnolipid biosurfactant in flotation could potentially hinder flotation kinetics and efficiency due to its strong foaming action. These effects will be of particular importance for the actual flotation process, in which this biosurfactant would be used as a collector or frothing agent.

## References

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