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Oxygen transfer of microbubble clouds in aqueous solutions – Application to wastewater

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Abstract:

This study aims at improving the knowledge on the effects of gas injection, bubbles sizes and contaminants on oxygen transfer in microbubble clouds. First the effects of gas injection on oxygen transfer are studied and linked to several parameters that change together with changes in flow rate, namely bubble sizes and rise velocities. Oxygen transfer is then studied in the presence of contaminants that are shown to affect bubble size distribution, modify bubble dynamics and interfacial mass transfer. Oxygen transfer efficiencies are also measured in wastewater and compared with those obtained in aqueous solutions. The agreement between contaminated water in the lab (Triton X100) and wastewater experiments is emphasised as this offers the possibility to develop fundamental understanding relevant to wastewater under laboratory conditions. The role of the surfactants on the volumetric oxygen transfer coefficient is further analysed in terms of specific interfacial area and transfer coefficients, respectively. Interestingly, this shows that the increase in oxygen transfer efficiency as the concentration in Pentanol increases is due to the increase in interfacial area while the transfer coefficients decrease.

Keywords: microbubbles, bubble column, oxygen transfer, surfactants, wastewater