Liquid mixing time and gas holdup in a bubble column bioreactor

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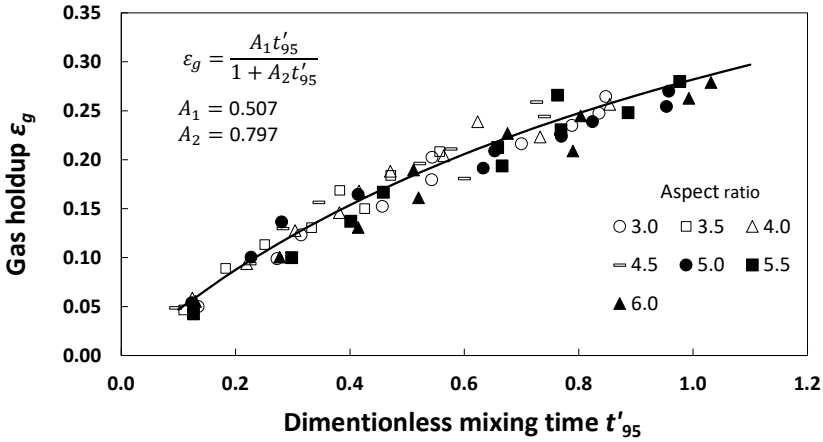
Bioreactors are widely used across many sectors of industry, especially in pharmacy and food production. Bubble columns are one of the bioreactor types suitable for cultivation of organisms sensitive to high shear forces, which often require careful supply of oxygen and other important nutrients. Therefore, controlled aeration and homogenization need to be established, especially in the case of tall bubble columns with high aspect ratios (liquid height to column width).[1] The aim of the research is the experimental study of homogenisation and aeration in a bubble column in dependence on operational conditions and aspect ratio.

Experiments were carried out in a bubble column with an inner diameter of 0.19 m, gas flow rate in the range 2–20 m^3/h and aspect ratios ranging in 3.0–6.0. Aeration was quantified by gas holdup measured from the change of dispersion height. Homogenisation was quantified by mixing time t_{95} measured via the colorimetric method based on tracer experiments. Acid and alkaline solutions were used



as tracers and concentration changes were visualized by a pH indicator. Colour changes were recorded by camera and evaluated via image processing.[2]

Obtained results provide a significant influence of aspect ratio on both gas holdup and t_{95}. Based on data analysis, a correlation between t_{95} and gas holdup was developed considering an influence of operation conditions and aspect ratio.

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References

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