

One-millilitre microbioreactor with impeller for improved mixing

Bolic, Andrijana; Krühne, Ulrich; Prior, Rasmus A.; Vilby, Tobias; Hugelier, Siewert; Eliasson Lantz, Anna; Gernaey, Krist V.

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One-Millilitre Microbioreactor with Impeller for Improved Mixing

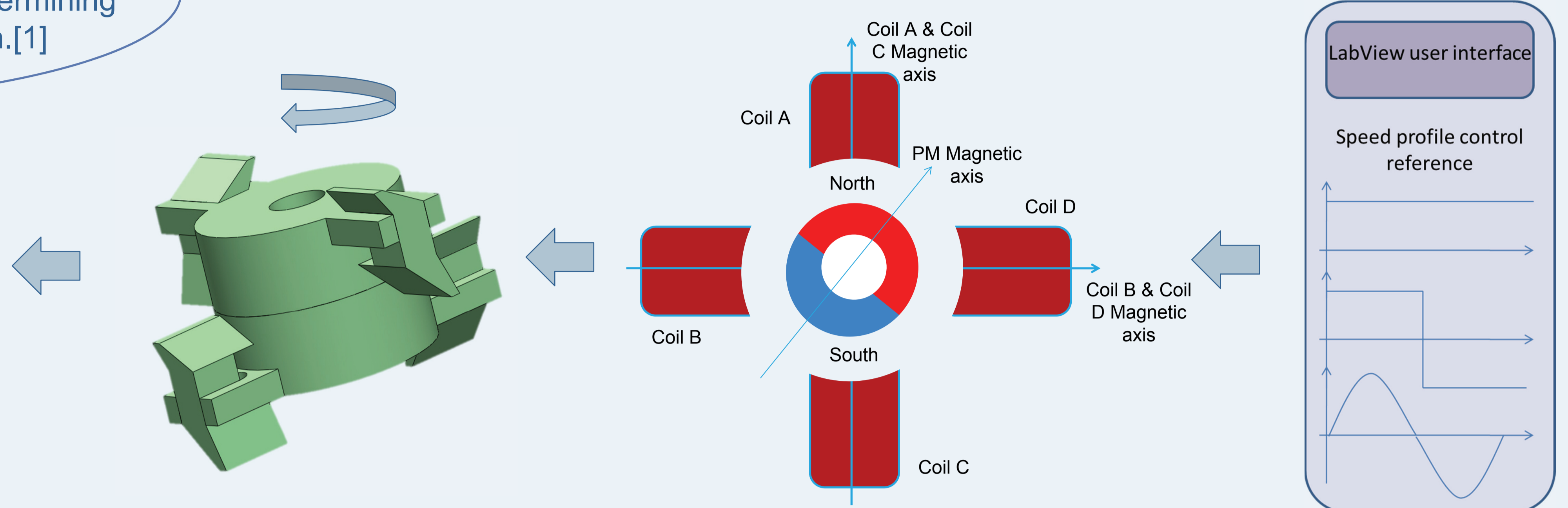
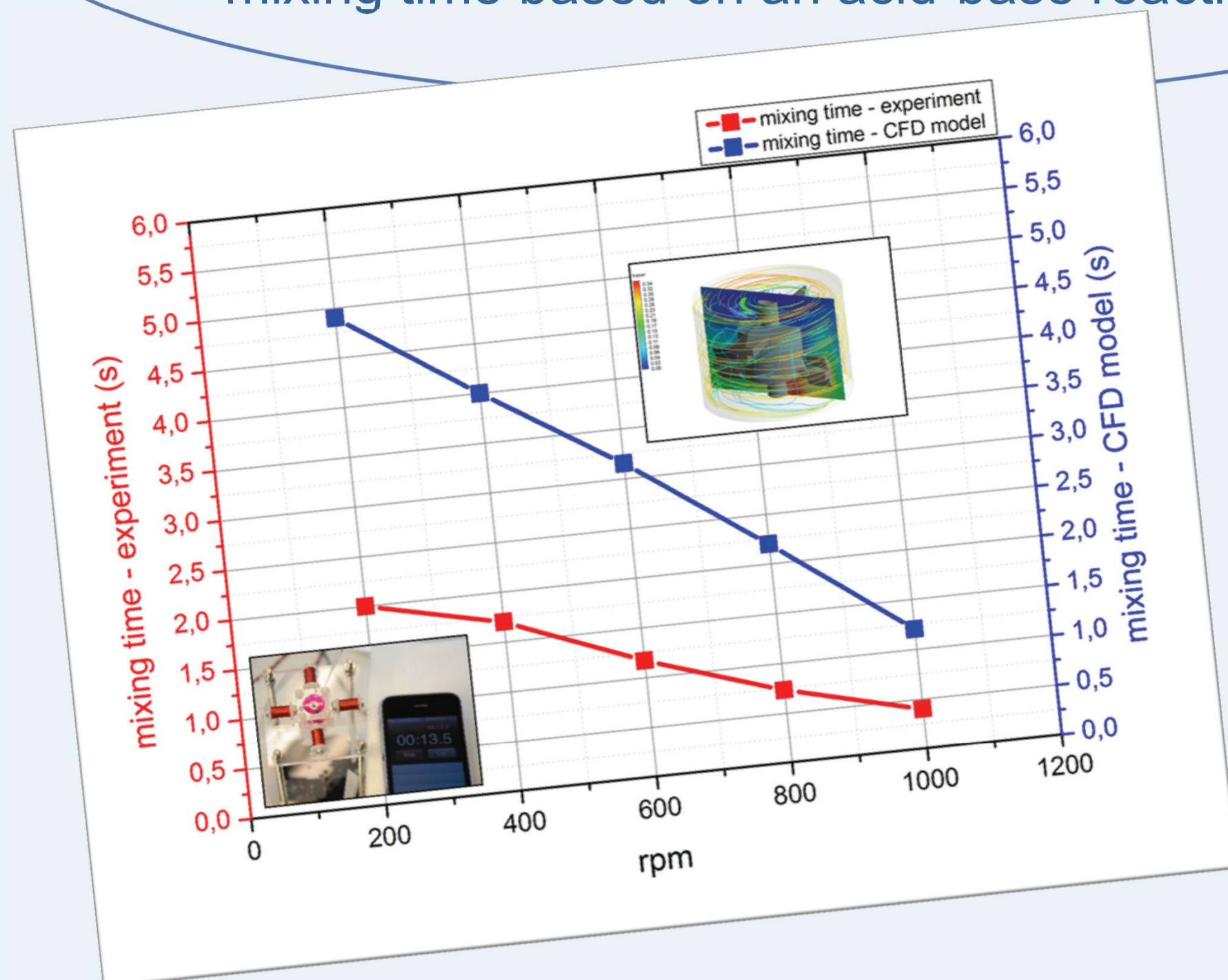


Andrijana Bolić¹, Ulrich Krühne¹, Rasmus A. Prior¹, Tobias Vilby¹,
Siewert Hugelier¹, Anna Eliasson Lantz², Krist V. Gernaey¹
anb@kt.dtu.dk

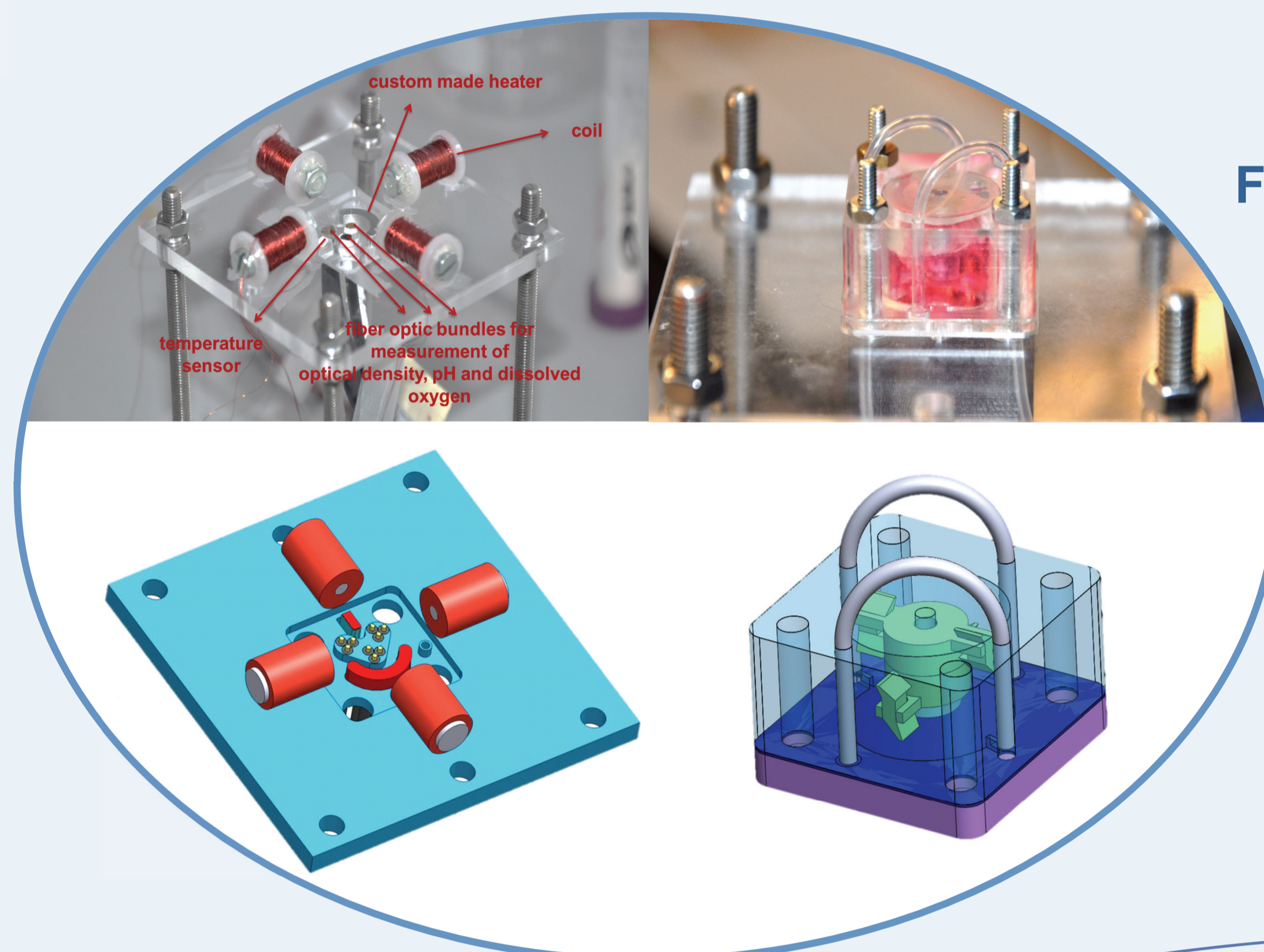


¹Dept. of Chemical and Biochemical Engineering, ²Dept. of Systems Biology
Technical University of Denmark (DTU)

The mixing capability of a microbioreactor was quantified using a conventional colorimetric method for determining mixing time based on an acid-base reaction.[1]

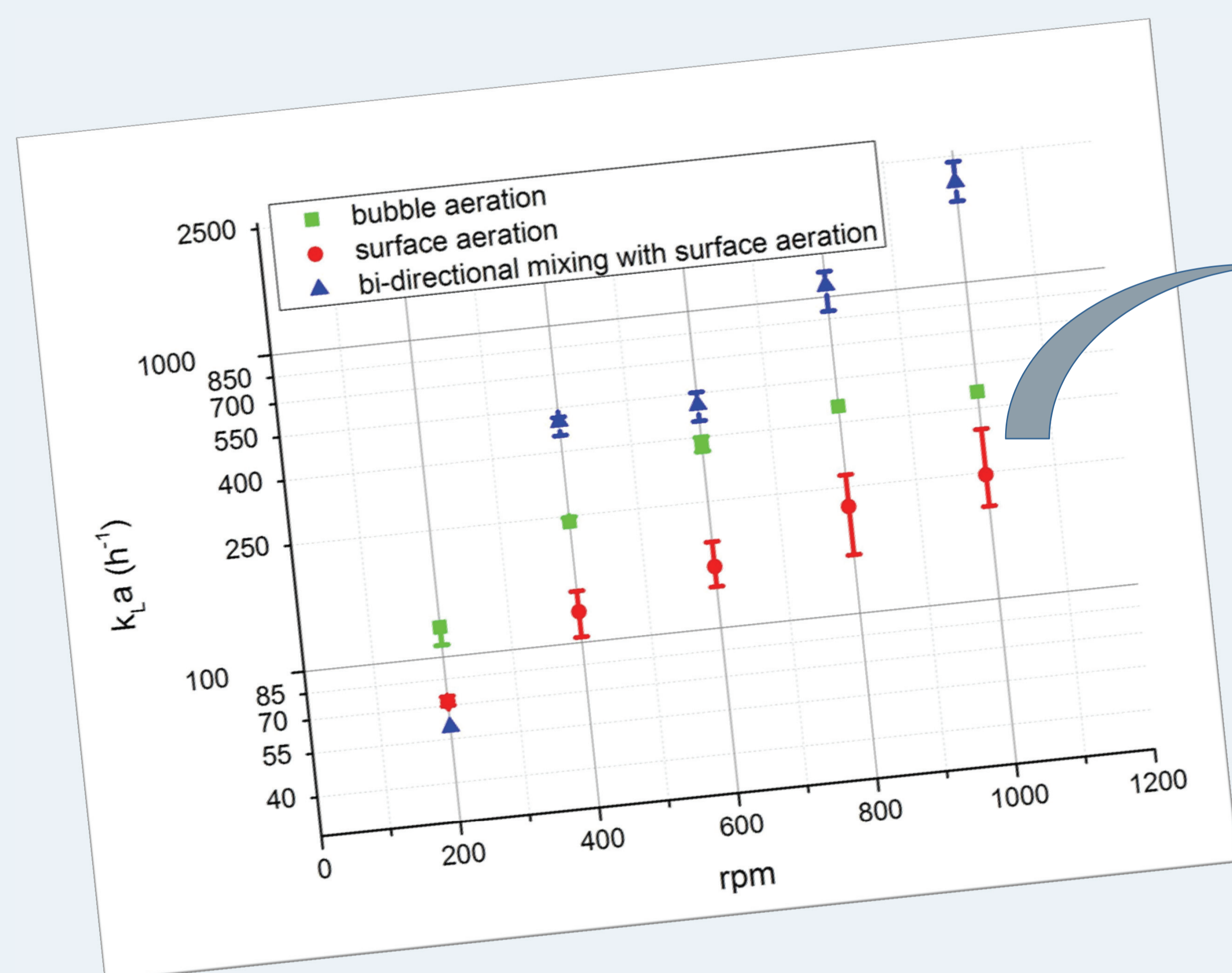


- Small footprint
- Disposable
- High level of flexibility:
 - ✓ Surface or bubble aeration
 - ✓ One- or bi-directional mixing
 - ✓ Volume (0.5 – 2 mL)
- Mixing can be considered almost instantaneous
- Bi-directional stirring eliminates need for baffles
- $k_L a > 1000 \text{ h}^{-1}$
- $k_L a$ obtained by surface aeration is sufficient for standard cultivations

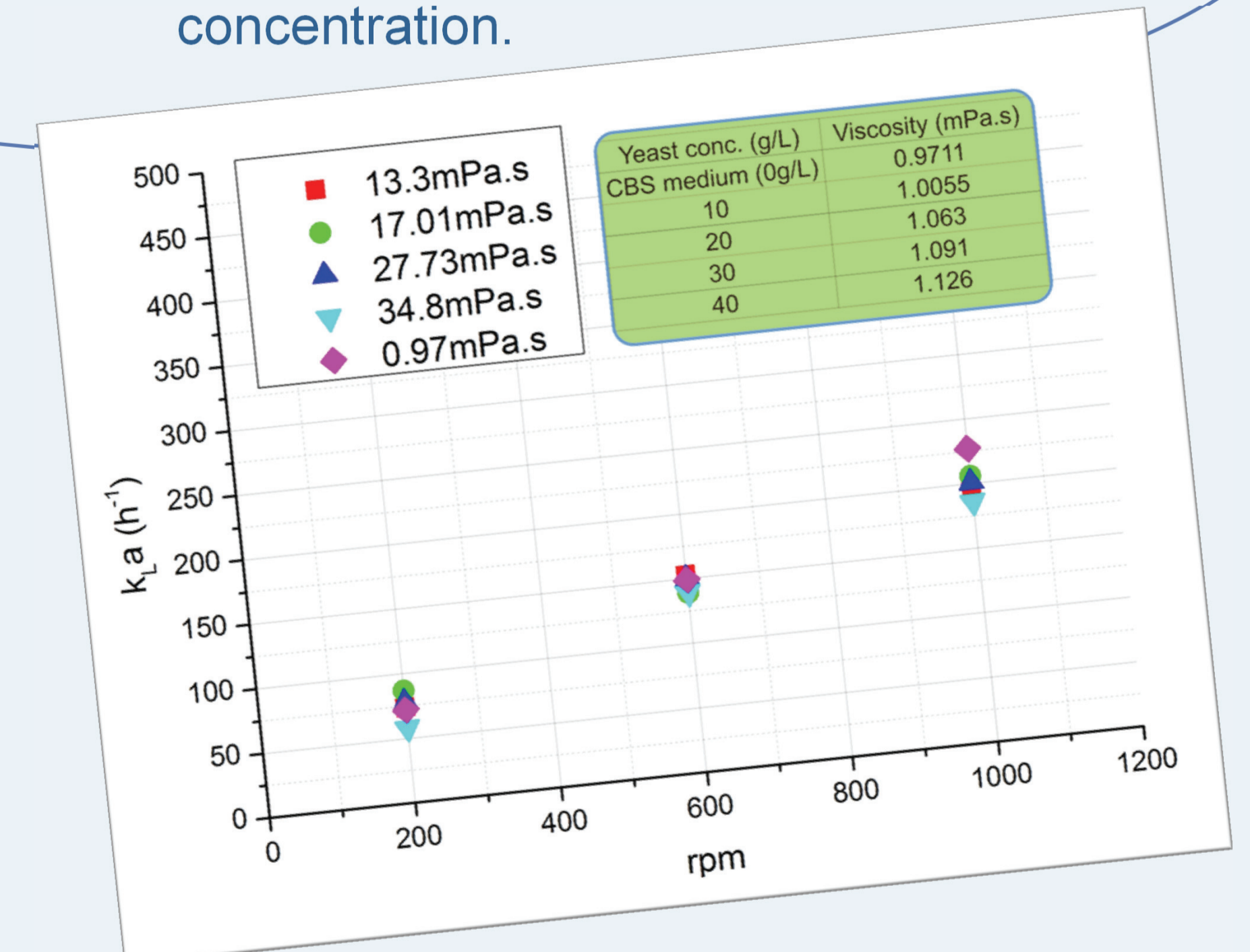
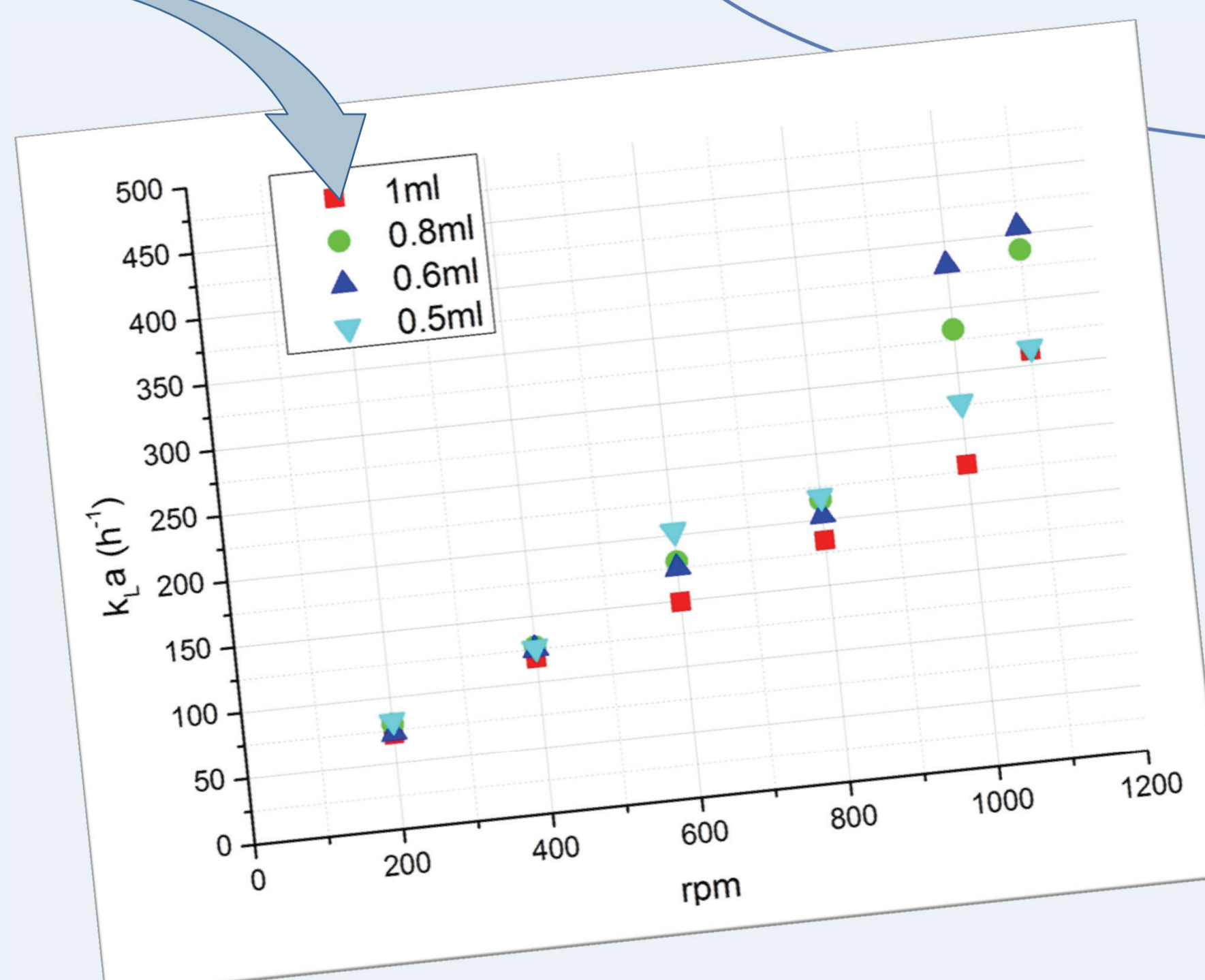


Fully controllable mixing integrated :

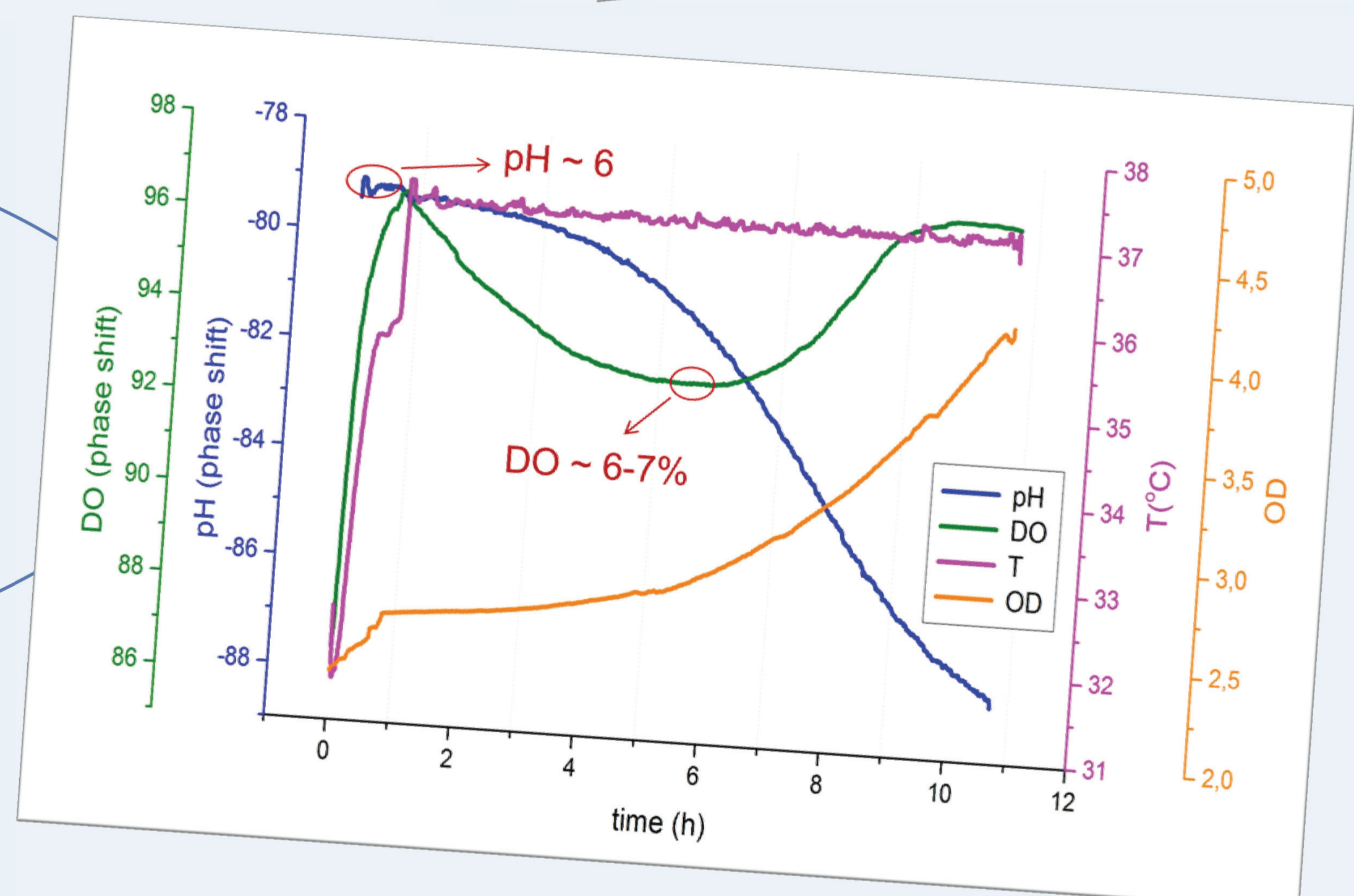
- ✓ Magnetic stirrer with adjustable geometry
- ✓ User defined stirrer speed profiles (change of rotation direction and speed)
- ✓ Low cost and maintenance free
- ✓ Stand alone – no external devices like plate shakers and motors



The gassing-out method was used to evaluate $k_L a$ values in the microbioreactor filled with CBS medium as a model liquid (without microbial cells).[2] Presens sensor spots with a response time between 10 and 14 seconds were used for measuring the dissolved oxygen concentration.



Anaerobic batch cultivations, with *Lactobacillus paracasei* as a model organism, were performed in the microbioreactor and in a 2L fermenter in order to characterize the performance of the small-scale reactor. End-point measurements of glucose and lactic acid concentrations as well as the optical density were used for the comparison between two scales. Growth of *Lactobacillus paracasei* in the microbioreactor was faster than in the 2L fermenter, which was confirmed by higher values of optical density and lactic acid and a lower value of glucose after 11 hours of cultivation.[3]



References

- [1] Paul EL, Atiemo-Obeng VA, Kresta SM, editors. 2004. Handbook of industrial mixing: Science and practice. Hoboken: John Wiley & Sons.
- [2] Stanbury PF, Whitaker A, Hall SJ, 1995. Principles of fermentation technology: Oxford, UK: Elsevier Science Ltd. pp 243-253.
- [3] RA Prior, T Vilby, 2012. Bachelor thesis, DTU

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